Remodelling a Large Plant with an Interesting History

The Old Engine and Boiler Works of Bertram Engine Works Co., Toronto, Purchased by Berg Machinery Mfg. Co., Have Been Completely Remodelled, Considerable New Machinery Installed, and Old Machinery Completely Renovated.

The Berg Machinery Mfg. Co., Toronto, successors to the firm of A. Berg & Sons, engineers, who began operations in Canada four years ago, have acquired the extensive foundry and machine shops formerly operated by the Bertram Engine Works, which was one of the largest establishments of the kind in Canada.

In 1893, the Bertram Engine Works, Co., Ltd., succeeded the John Doty Engine Works and almost every year since 1893 new machines have been added to the plant and other improvements made. It will, no doubt, be interesting to give a short history of the growth of the works now occupied by the Berg Mfg. Co.

John Doty & Sons, started in a small way building gas engines on the east side of Bathurst Street, near the water front. The gas engines worked with illuminating gas and were built in quantities. They were crude affairs, compared with those of to-day, but found a ready and large sale. This company built the Primrose and Mayflower, two boats for the lake trade. They built a large machine shop on the present site in 1892, and carried on a large business until they moved to Goderich. The Doty Engine Works at Goderich are now carried on by Fred Doty, son of the founder of the John Doty Engine Works Co. The two sons, Fred. and his brother, built a sand pump when at Bertrams, which firm they managed for a time after their works were sold out to the Bertrams.

At the Bertram Engine Works, were constructed marine craft of all descriptions, including the wide range running from shallow draft launches to the largest and staunchest vessel for freight-carrying and for passenger service. Six grain barges were built for the Prescott Elevator Co., in 1897-1899, and a number of side-wheel tugboats for the Upper Ottawa Improvement Co. Six of these are still in service. The large passenger steamers, Corona, Toronto, Kingston and Montreal, were built at the Bertram Works.

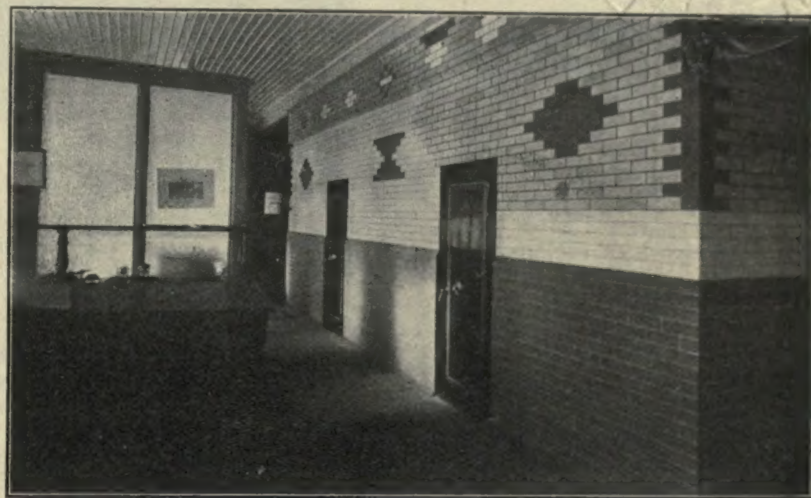


Fig. 2—The Office.

Connected with the works were large shipyards, which are now used as a dock under the management of J. W. Gerrell, formerly general manager of the Bertram Works.

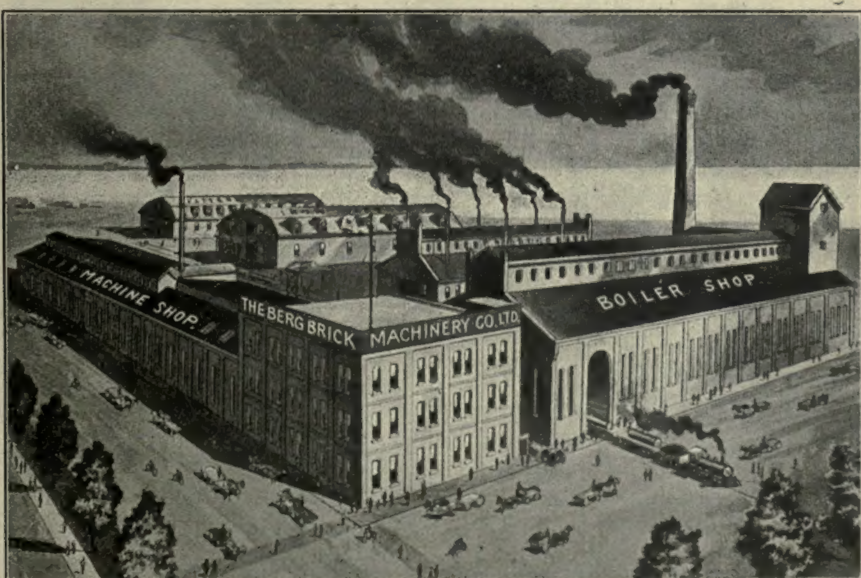


Fig. 1—Bird's-eye View of the Berg Machinery Manufacturing Co.'s Plant.

The first president of the Bertram Works, was Geo. Bertram, who was followed by his brother, John, and afterwards Robert, son of John Bertram.

The Bertram Engine Works constructed and erected engines up to 3,200 horse power of different designs. The output of the Bertram Works is to be found as far north and west as the Stickeen River, B.C., and as far east as St. John, N.B.

In 1895, the Bertram Works was absorbed by the Canadian Ship Building Co., consisting of Fred. Nicholls and associates. They afterwards built a ship yard at Bridgeburg, and the Bertram plant was sold to the Berg Machinery Mfg. Co. Since this latter company took hold of it the works have been completely remodelled, considerable new machinery installed, and the old machinery completely renovated. Before taken over by this firm the works were in bad shape, but the work which has been put on the several shops during the past year have made them practically new. New equipment, which has been added, in the way of tools, traveling cranes, etc., make the plant quite up-to-date.

It may be interesting to note that the first Berg brick press built in Canada was made at the Bertram Engine Works. Besides, a line of brick machinery the Berg Machinery Mfg. Co. intend to make producer gas plants, the patents for which the company now have, gas engines, cement machinery, mining machinery, including crushers, pulverizers and concentrators, engines and boilers.

Anton Berg, inventor of the Berg Brick Press, has had about twenty years' experience with the highest grade of brick machinery, and is a mechanical engineer. He is a Norwegian by birth.

He is assisted by John Berg, the eldest son, and Severn, junior member of the firm, who has learned his trade as a machinist and mechanical engineer. His son, Charlie, is at present learning his trade in the works. Over two hundred of the Berg presses are now in use in the United States. In the four years they have been in Canada, twenty-three brick factories have been equipped with Berg presses.

The corner building shown in Fig. 1 was formerly taken up as a machine shop. Now handsome offices have been built on the first floor on the west side of this three-storey building. In the offices are large vaults. The half-tone Fig. 2 does not do justice, because the color scheme is lost to some extent. It shows a sample of brick from every factory in Canada that uses the Berg machinery. It is the most striking silent argument in brick. The vault is arranged for records, plans, drawings, etc. A complete laboratory is being equipped so that customers can supply samples of their material,and have the press made to suit the grade of brick, which can be turned out with the available material.

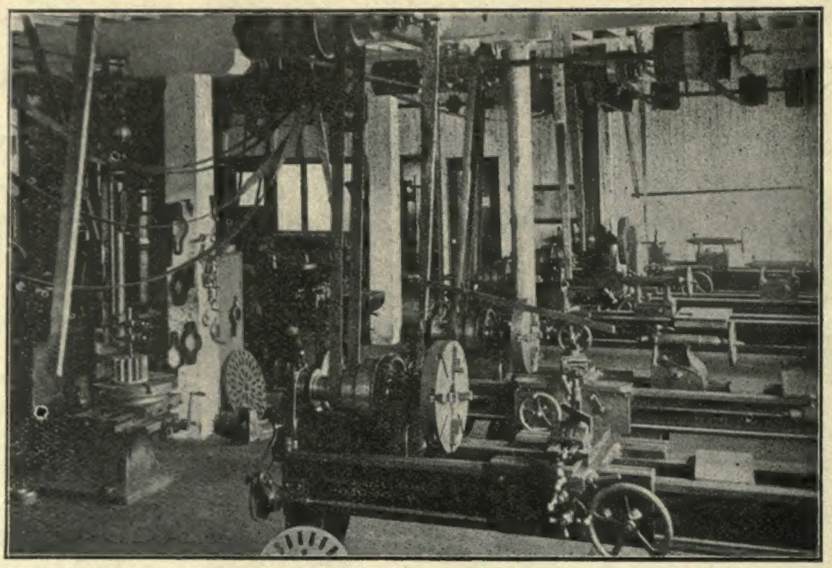


Fig. 3—Machine Shop.

The machine shop occupying the remainder of the first floor of the three-storey building is shown in Fig. 3. All the machines have been over-hauled and arranged in order so that the shop presents the appearance of a model machine department. Fig. 4 shows the erecting shop with several presses ready for shipment. Traveling cranes have been installed greatly facilitating the handling of the machinery. Lathes are arranged

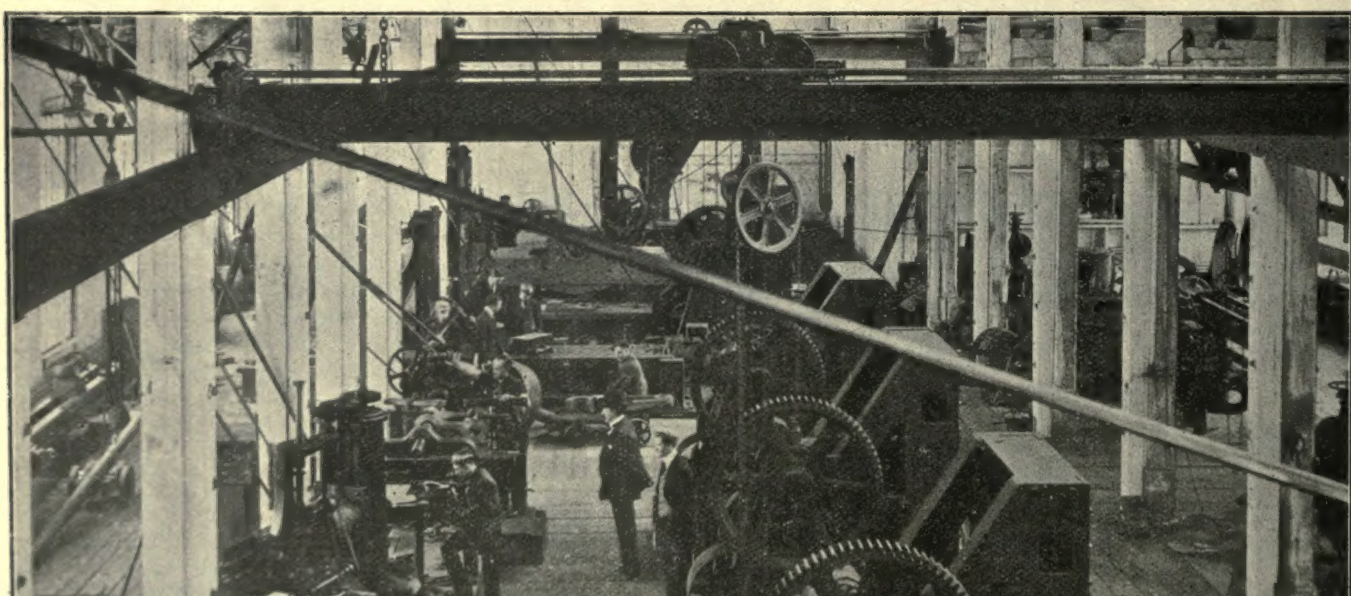


Fig. 4—Eastern Machine Shop and Erecting Shop.

beside the windows and the heavy machinery has been put on concrete foundation. Previously, the floor was built on posts, but this has been changed and the machines are given great rigidity, by having the foundations cemented into the walls. This greatly reduces the insurance risk. A steel stairs leads up to the second storey to the tool room. At the head of the stairs is a lookout so that a foreman can watch both the tool room and the machine shop. These shops contain many machine tools, which have been in use for several years. These have been repaired and are now as good as new. Among the machines in this department are those from the works of John Bertram, Bertram & McKechnie, London Machine Tool, Becker-Brainard, Imperial, Canada Machine Co., Sarnia, etc. Some of these machines are specially built, one boring mill accommodating work sixteen feet in diameter, and one planer being 72 in. by 72 in. by 14 ft., with three heads on cross-rail. A tool room has been arranged on the ground floor and all the tools have been gathered from the machine shops and arranged systematically on shelves.

In the corner building on the second floor is the private office formerly occupied by George and John Bertram. John Bertram, who was a brother Scotchman of the late John Bertram, Dundas, was quite aesthetic in his tastes as the plaster casts still on the walls of his private office indicate. Four pastoral scenes represent, L'Automne, L'Hiuer, L'Ete and Le Printemps, all of which are very artistic.

On the top floor of the corner building is the pattern shop equipped with the necessary tools and machinery for pattern making. A small store room for patterns in constant use is also on this floor.

At the east end of the machine department is the foundry, equipped with two large cupolas with a capacity of fifty tons per day. Four large gib cranes cover the whole of the foundry.

In a large building in the rear is the old erecting department. The machines from this building have been placed in the over-hauled machine shop, and it is now used for storing steel, boiler tubes and patterns. The patterns are all indexed and a duplicate index is kept in a book in the office so that any pattern may be easily found.

In the flange shop the company can turn nine-inch flanges on one-inch plate. The hydraulic flanger used in this shop can exert a pressure of 200 tons or 2,000 lbs. to the square inch. This machine has turned a $10\frac{1}{2}$-in. flange at the rate of about 4 ft. every twenty minutes.

Fig. 5 shows a view of a corner of the boiler shop after it was overhauled. The boiler shop is fully equipped with the heaviest and most costly machinery on this continent, Scotch, German and United States manufacturers' names showing upon the nameplates of the builders. A radial drill from Smith Bros. & Co., Glasgow, will accommodate work 14 ft. wide, and 10 ft. high. A large set of rolls each 26 in. in diameter

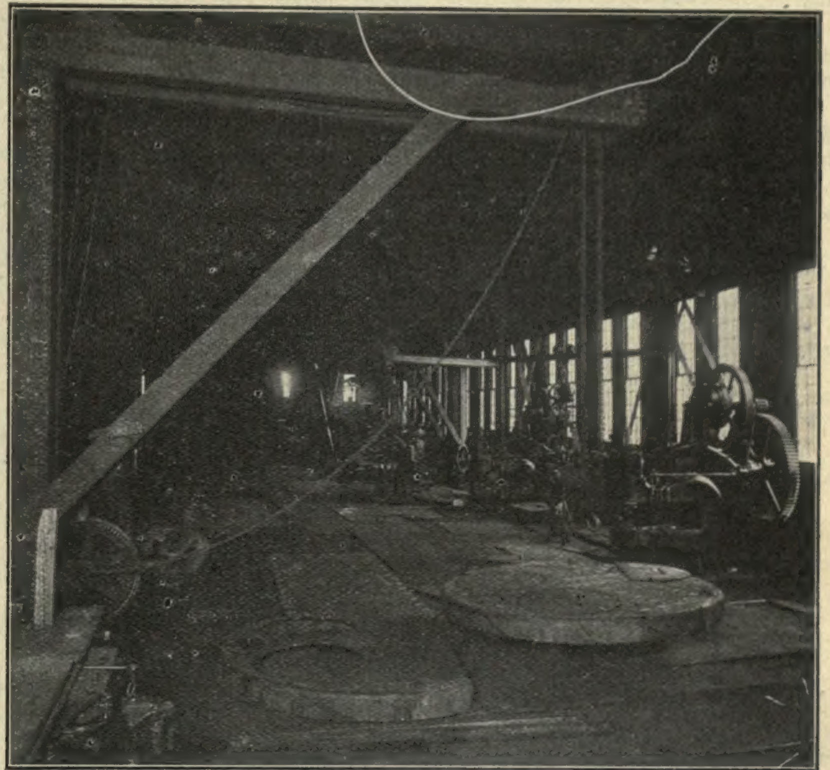


Fig. 6—Boiler Shop.

will accommodate work 22 ft. long. A 50-ton crane has an 80 ft. lift, and is used in connection with an hydraulic riveter built by A. Thompson, Fitchburg, Mass. There is a large assortment of other rolls, punches, planers, boring mills, radial drills, etc., all arranged so that work will pass through the shops with greatest facility. Each machine has its own jib crane. Large marine boilers and hardening cylinders for brick are manufactured here. These latter are three-quarter-inch steel plate, 76 in. in diameter and 65 ft. long. Each cylinder will cure 20,000 bricks under steam pressure in from ten to twelve hours. These each weigh 27 tons. An elevated foreman's office has been erected at one end giving a full view of the boiler shop.

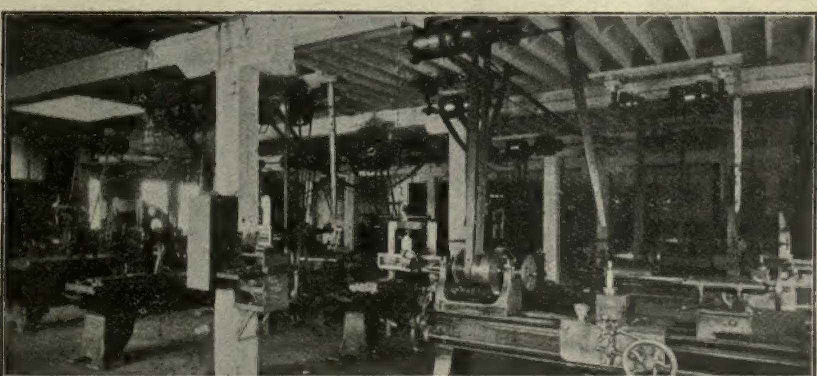


Fig. 5—Tool Room.

In the engine room is a John Doty engine, of 90 h.p., built sixteen years ago. It is still in good order. This engine supplies part of the power. There are also two compound air compressors, supplying compressed air to the boiler and machine departments.

The forge shop contains five forges and a steam hammer made in the Bertram Engine Works. The whole plant covers about five acres. Supplies are brought in and shipments made by means of a G.T.R. spur track. A 15-ton

yard crane is used for loading and unloading. Tracks run into the machine shop and machines are easily moved to the point where shipment is made.

It is expected that when the plant is working to its capacity it will employ about five hundred hands. The works having been remodeled and made ready for manufacturing, the Berg Machinery Mfg. Co. expect that with the present bright prospects, this will be at no far-distant date.

WELDING LOCOMOTIVE FRAMES.

By A. W. McCaslin.*

On the Pittsburg & Lake Erie railroad we repair some of the engine frames as many others do at this time, without removing them from the engine. We have very good results in the heating, as far as appearance of the completed job superficially would indicate, but I do not say that we weld these frames, for I do not consider such an operation made without a lap of some kind deserving the name "weld." In fact, this butting of frames is simply a burlesque on proper welding. I have satisfied myself as to the virtue of this so-called weld by making several in the shop, giving them many advantages that cannot be offered on an engine, and invariably they would separate showing very little resistance, from the light blow crosswise of the weld under a small steam hammer. The breaks would show that a union of the metal had been effected, but would also show a very feeble tenacity. Yet knowing these facts, I am very much in favor of repairing frames th s way wherever it is possible to spread the frame and take the heat, as it frequently keeps the engine in service until its time comes for general repairs, and this means quite a saving in money to our companies.

We have what we think, splendid burners, and build a very satisfactory furnace with standard size firebrick. Mr. Shoenberger, foreman blacksmith, in the Fort Wayne shops at Pittsburg, kindly furnished me the original design for both of them. See Fig. 1.

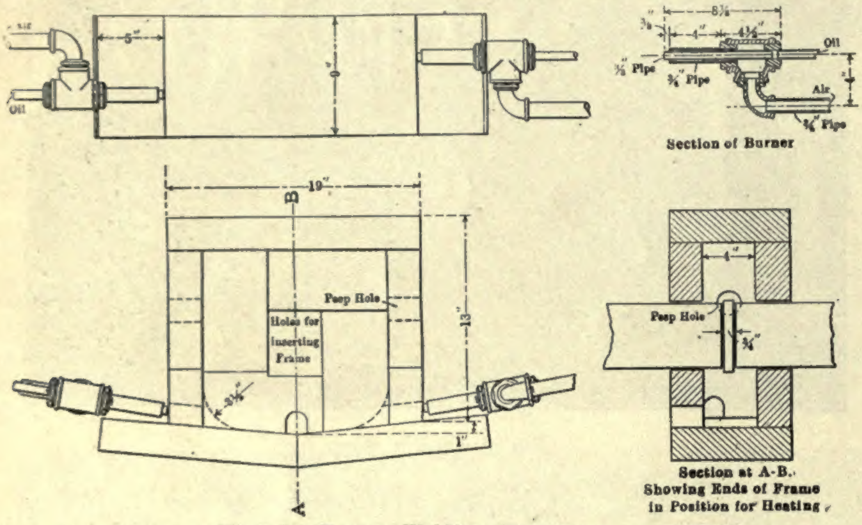


Fig. 1.—Frame Welding Furnace.

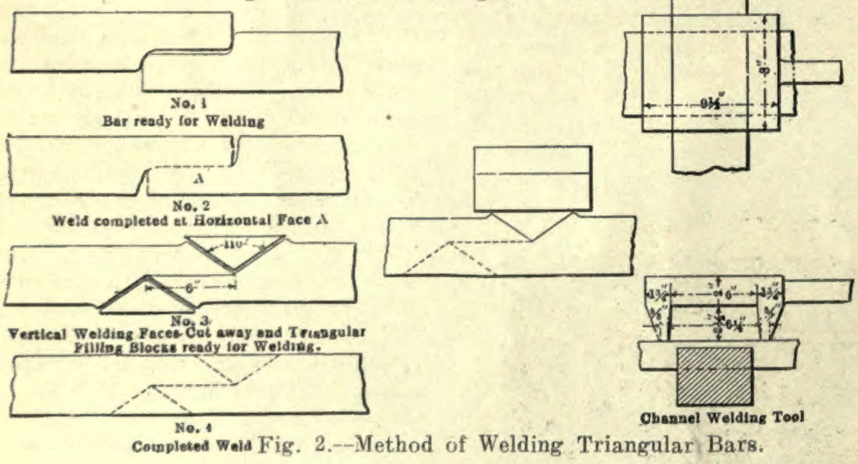


Fig. 2.—Method of Welding Triangular Bars.

I build the furnace with the bottom inclined, as shown in blueprint, making it about 1 inch lower at its centre than at the fuel holes at the ends. Have also added a small slag hole at the centre near the bottom, so the slag will not gather and be blown up against the frame. We use two burners to this furnace, and crude and carbon oil as fuel, and take a very slow heat. The bottom inclined as mentioned, helps to prevent the wasting of the bottom side of the frame and gives the heat a start to return over the top of the frame and out the peep hole. When the heat is complete the furnace is pushed away into the pit and the work completed with light sledges.

I do not approve of making the side V-weld under a heavy steam hammer without using a channel tool. The "laid-in" piece travels or flows both ways from its centre, crosswise of the frame, without interference or resistance, and does not spread enough with its angle to increase the lap or to weld properly against the walls of the V out in the frame. That is, it cannot weld properly while flowing in a direction paralleling the walls of the V in the frame. This piece will travel alone, the bulk of the frame preventing the walls of the V-cavity following. If we cut off the ends of this weld it will appear all right, the drag of the iron being just sufficient to hide the weld. The iron in the piece laid in will not be compact near its ends, neither will the weld near its ends be meshed to a sufficient depth.

This will be entirely different, and is a satisfactory piece of work, if done under a small steam hammer with light blows, or with heavy sledges. In this case the laid-in piece should be properly made, and the overhang not cut too close to the frame. The side heats should be drawn well up to the point of the V-piece, and this stock driven back into the weld and at the same time form a lap where it is so much needed, that is at the ends of this weld on top and bottom of the frame back.

If the side V-weld is made in a frame under a heavy steam hammer there should be a heavy channel tool placed on top. This tool should be 8 inches wide, cut out 2½ inches deep, ½-inch longer in the crown, and ¾-inch longer at the mouth than the cross-section of the frame, that it may release readily. It will shear off the extra stock, prevent the laid-in piece from lengthening endw se, will drive it back into the weld, force it against the walls of the V and lengthen the lap lengthwise the frame. Then take a second heat on the laps and there will be no hole or opening at the points of this weld. This is not only the most convenient weld to make in repairing frames but it is the best.

We sometimes make in the front sections of frames and in large hammer piston rods, what we call a lap and V-weld. We flatten the end of each piece nearly one-third, make the lap and weld as shown in Fig. 2, then drive back the end of the laps and lay in a V. This insures a solid centre and a solid side opposite each V, which throws the laid-in pieces about 6 inches apart. This weld will elongate evenly when being reduced and will not slip nor shear as the ordinary lap or V-weld will.

* Paper before the International Railroad Blacksmiths' Association.

New Departure in Metal Cutting Tools Without Clearance*

This Paper Sets Forth a Turning Tool that is Intended to Cut Without Clearance—It is a Radical Departure in the Practice With Cutting Tools.

By JAMES HARTNESS

The tool consists of a cutter and a holder so constructed as to allow the cutter a slight oscillatory freedom in the holder. The centre line on which the cutter oscillates is substantially coincident with the cutting edge. The oscillation of the cutter about the centre line does not affect the position of the edge, but it does allow the face of the cutter to swing around to conform to the face of the metal from which the chip is being severed.

The objects of this construction are to make possible the use of more acute cutting edges in order to reduce the cutting stresses; to equalize wholly or partly the unbalanced side pressure on the cutting edge; and to obtain a rubbing contact to prevent lateral quivering.

In order to bring out these objects it is necessary to analyze briefly some of the conditions under which metal is worked in a lathe, dealing particularly with cutting angles, clearance of cutting edges, and the importance of minimizing the tendency of the work and tool to separate under cutting stresses.

No attempt is made to discuss the forms of cutting edges for withstanding the heat of high speed service. The generally accepted cutting angle of greatest endurance under high speed is about 75 deg., and the angle of least resistance, according to some of Dr. Nicolson's tests, is about 60 deg., with an increase below as well as above that angle.

The cutting angles of the tool described in the present paper may be varied from the present orthodox angles down to 30 deg. or less, according to the nature of the work.

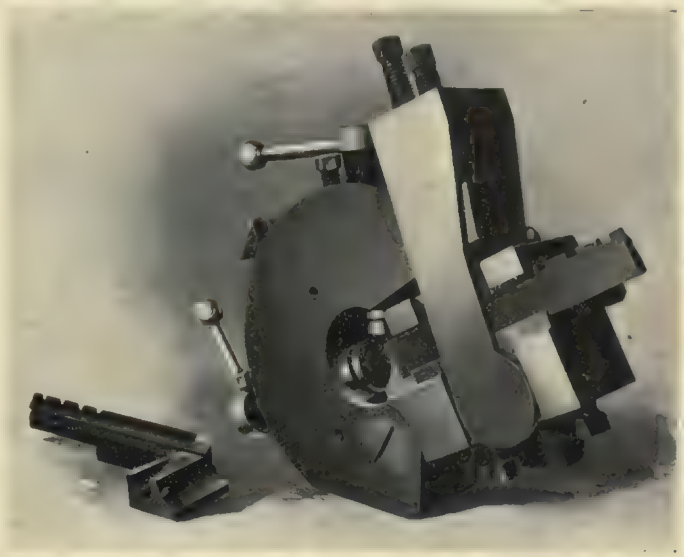


Fig. 1—The No-Clearance Turning Tool for Flat Turret Lathe. This Tool has Double Attachment for Turning Two Sizes. See Figs. 4-6.

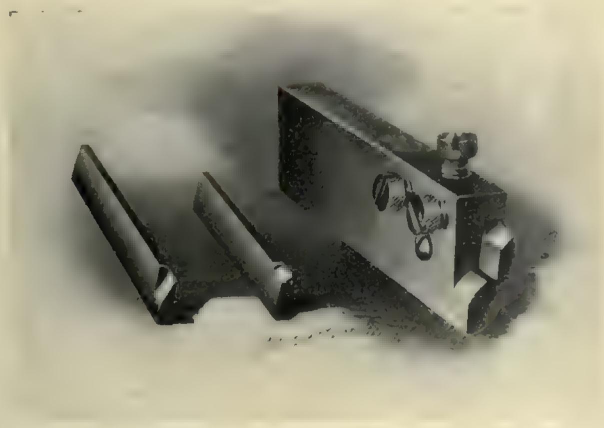


Fig. 2—No-Clearance Tool for Standard Engine Lathe Tool Post with Three Cutters of Different Angles.

The results obtained by Dr. Nicolson, which showed an increase in cutting stress for tools more acute than 60 deg., may have been due to the cuts having been run without cutting oil or suitable cutting lubricant. Furthermore, the comparative lack of durability of the more acute edge below 70 deg. may have been due either to heat or lateral quivering or both. The heat would have been greatly reduced by a liquid cooling medium, especially one having some lubricating qualities, and the lateral quivering may now be eliminated by means explained in this paper. The thin edge of an acute tool is obviously the least suited to carry off heat or to withstand the quivering incident to cutting.

This paper is intended to suggest a scheme for widening the field of investigation. Instead of approaching the subject as a scientist bent on getting exact data regarding performance of certain existing forms of tools and machines, the writer's line of approach has been from the standpoint of a designer and manufacturer of lathes, and particularly lathes of the character of the Flat Turret Lathe.

Class of Work Here Considered.

The means for cutting set forth should be considered from the standpoint of one who sees nothing but lathe work under 20 in. in diameter, and of the kind usually found in any machinery

* Paper read at New York meeting of the American Society of Mechanical Engineers.

building plant, whether it is a navy yard, railroad shop, or automobile building plant; not that the means are of no value in larger work, but being out of the writer's range of experience, such work was not considered in designing the tools descibed.

A more exact description of the range of work for which this tool is intended would be: lathe and turret lathe work under 20 in. and over 4 or 5 in. in diameter, and less than 8 or 10 in. in length; also work up to 2 and 3 ft. in length, of diameters under 3 to 3½ in. and generally over ¾ or 1 in.

It includes three classes of work: a, chuck work, having diameter generally exceeding length, and held wholly by a chuck or face plate; b, bar work which is held in the chuck and steadied by back rests; and, c, work having dimensions similar to bar work, but which must be turned on centre points, with or without following and fixed steady rests.

It will be noticed that this excludes all of that kind of larger and heavier lathe work in which the principal duty of the lathe is the rapid removal of the stock. In the particular branch of work under consideration the rapid removal of stock is important, but not paramount.

Although the field of work includes all kinds of steel and cast iron, this paper will deal only with the standard open hearth machinery steel of about 20 points carbon.

In work supported on centres and in chucking work, the connection between the work and tool includes a number of joints, both for sliding the tool in relation to the work, and for the rotation of the work. Each of these joints has more or less slackness, and each of the slides and other members is more or less frail in structure. With a mounting of this kind the cutting edge of the tool does not pass through the metal without swerving and flinching.

Type of Tools Used.

In the class of work under consideration each piece has several diameters, with shoulders which should be accurately spaced and formed. Nearly all the shoulders required in this class of lathe work are the so-called square shoulders.

In engine lathe practice these shoulders are "squared up" by a side tool after the other turning has been done by a round nose or diamond point tool, but in the turret lathe for bar work these shoulders are produced by the same tool that takes the stock removing cut.

The tool used in turners for bar work cuts on the same principle as the engine lathe side tool; that is, its rake or top slope is almost wholly side slope, and its cutting edge stands at an angle of 90 deg. to the axis of the work.

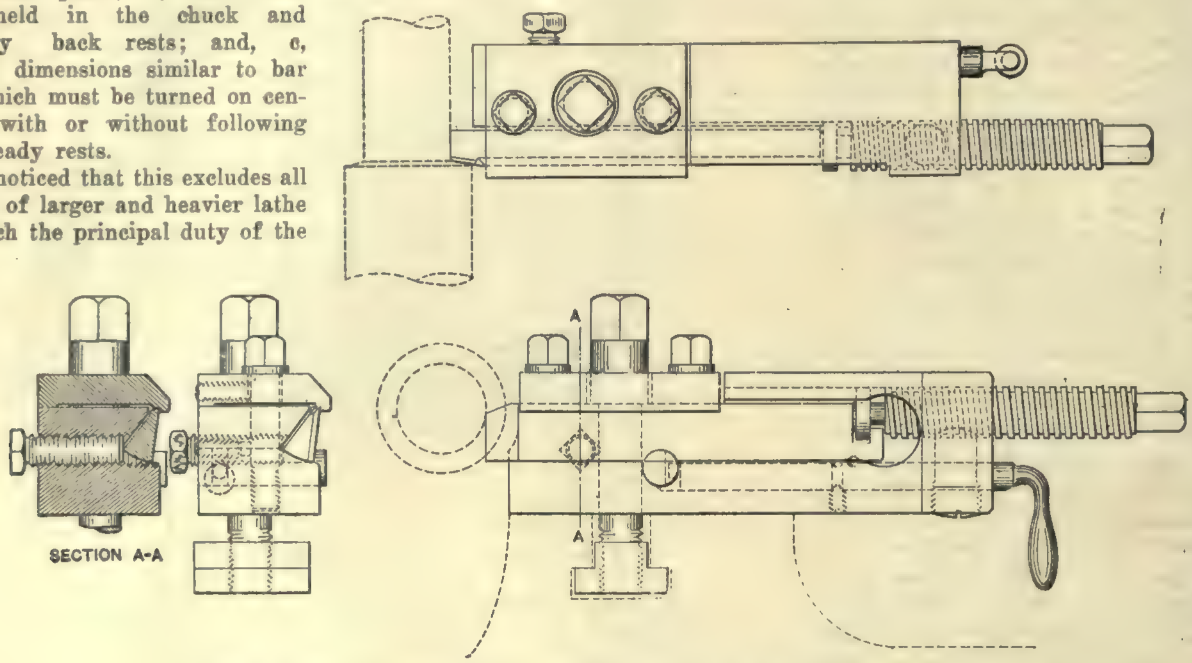


Fig. 3—Form of Turning Tool and Holder for Engine Lathe.

In the engine lathe a tool of this character has generally been unsatisfactory for rapid turning, yet in the turret lathe this very tool seems to be universally used for all bar work. The difference in performance seems to be due to the difference in mounting. It works well where there is no chance of vibration, but trouble begins when it is used in a machine like the engine lathe or turret-chucking lathe in which the work is supported by one part of the machine and the tool by another, and the true path of the cutting tool through the metal is dependent on the entire structure of the machine, there being nothing to prevent quivering.

The no-clearance tool to be described is a side tool without clearance. Its under face bears flatly against the work, thereby preventing the lateral quivering which has previously made this type of tool inefficient.

Means for Improving Efficiency.

A machine's efficiency is proportional to its strength to resist its working stresses. There are two ways to increase this efficiency; a, by strengthening the machine, and, b, by reducing the stresses for a given result.

In the writer's previous work the strengthening of the machine has been accomplished by the elimination of unnecessary features, and placing the necessary joints for obtaining the various motions in the least objectionable positions. A single-slide scheme of lathe design was adopted to eliminate the complicated and frail construction of the multi-slide tool carriage which is now in almost universal use in all standard machine tools.

The next step was to devise a means for minimizing the stresses at the cutting edge, and the object of the present paper is to explain how this result has been obtained.

This reduction of stresses may not be important in roughing work in which a flinching of the work or machine may be disregarded so long as the machine continues to crush off the metal, but for the kind of work mentioned in this paper it has been considered of first importance.

Direct Cutting Stress.

For the purpose of analysis the cutting stress may be divided into three elements: the direct cutting stress, the separating stress, and the tendency to quiver, which we will consider in turn.

By direct cutting stress we mean that part of the stress that is directly downward in a lathe. With all other conditions unchanged, we should expect to

find that an acute-edged tool would offer the least resistance, and that the difference in direct cutting stresses for tools of varying cutting angles would show a marked reduction in favor of the more acute tools.

Dr. Nicolson's experiments below 60 deg., already mentioned, showed an increase in cutting stresses and a marked loss in endurance, but these tests were on dry cutting without the benefit of a lubricant or a cooling solution. The thin edge tool is undoubtedly benefited more than the blunt edge tool by lubricant or cutting medium. Just what cutting angle would be the best under conditions of most efficient cooling medium may not yet be fully known.

That there is no marked difference in the blunter tool of varying cutting angles really does not affect the situation when we try the real cutting or sliding angles, which may be roughly stated to be efficient in proportion to their acuteness.

It is obvious that the least direct cutting stress for a given depth and feed would be obtained by a straight-edge tool, and one that would take a chip in which there is the least molecular change.

Crushing and partially or wholly shearing the chip into chunks which are three or four times the thickness of the feed undoubtedly increase the working stresses and heat.

Dr. Nicolson clearly shows the great distortion that takes place even in

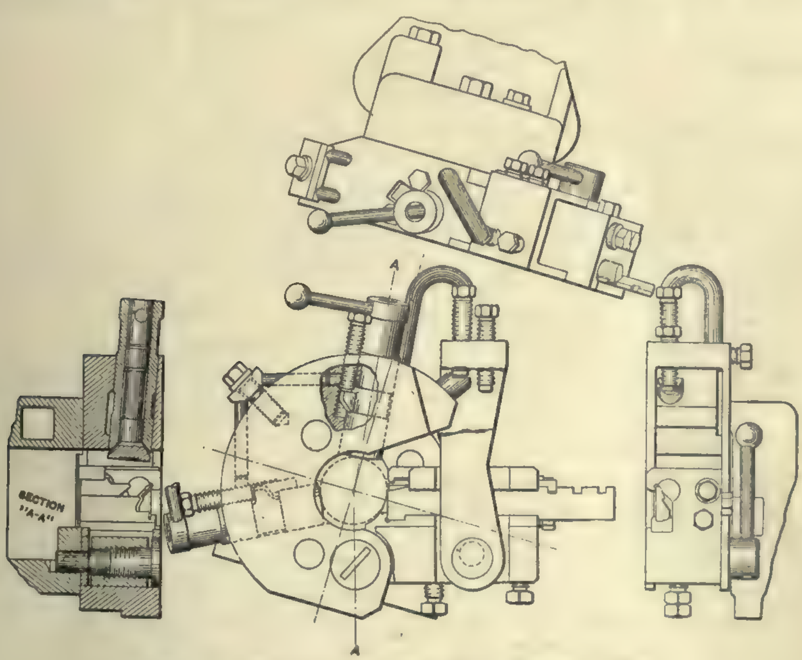
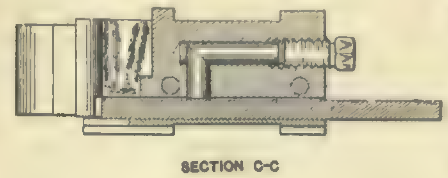


Fig. 4—Turning Tool for Flat Turret Lathe.

cutting with an acute tool of 60 deg. and a straight edge. This tool does not have even the disturbing element of shearing action at the edge of the chip, but the experiment shows the distortion of nearly every part of the chip. A tool having a round nose or a blunt edge would doubtless show still greater distortion.

A flat top slope should have a straight cutting edge. The more the edge is rounded the greater the conflict of the metal crowding to the edge. The flow



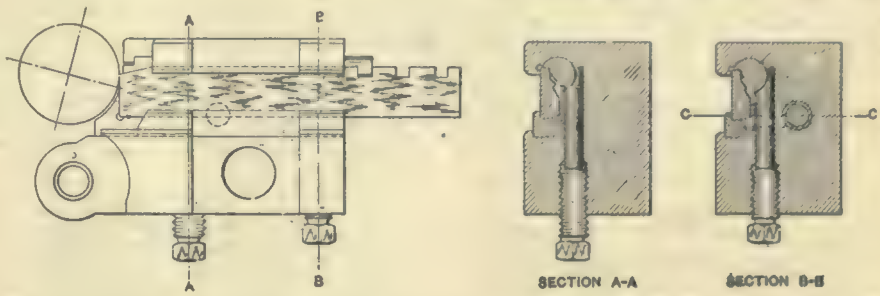


Fig. 5—Details of Turning Tool Showing Means of Holding Cutter and Limiting Oscillation.

of metal on the top slope of the round nose does not move in one direction wholly, but tends to travel towards the centre of the curve. The conflict of currents of metal which approach the centre from various parts of the curved cutting edge increases the direct cutting stress.

The crushing process of the present scheme of turning is due both to the bluntness of the cutting angle and the shape of the edge. A curved edge should have a curved top slope in order to remove the chip with the least distortion of the metal. The curved top slope for this purpose would make the shape of the cutting edge similar to the cutting edge of a carpenter's round-nosed chisel. This form of tool is not offered as a practical form, but is mentioned to emphasize the unnatural flow of the chip that must take place on the flat top slope of a round nose tool.

Separating Stress.

By separating stress we mean that stress which, in turning a shaft, forces the tool outward radially. Increasing this stress causes the work and tool to move apart, and results in variation in diameter, also in irregular and generally inaccurate product, particularly when the rough stock runs eccentric or irregular. Although this separating stress may be lessened by giving the tool more back slope, this is possible only in tools taking light depth cuts. A lathe tool, however, which takes a cut like a side tool, gives little or no tendency to separate radially.

With the side tool set at an angle of 90 deg. to the travel of the feed, the feeding stress does not tend to force the work and tool apart; in fact, this tool may be set so as to produce a slightly beveled shoulder either side of the 90 deg. so as either to draw the work and tool together when making an overhanging shoulder or to force the work and tool apart when producing an external bevel.

Quivering Stress.

The quivering stress due to the nature of the chip is affected by the cutting angle of the tool. The chunks which make up the parts of a chip are less firmly united in a chip taken by a tool of 70 deg. cutting angle than by a tool 50 deg., and, of course, the more firmly united chunks, give a more continuous chip with the least vibration of stresses.

In turret lathe practice, especially in bar work, the tool and work are held together by a back rest which follows on the surface produced by the cutter, and in some kinds of turret-chucking work the tools for interior work are mounted on boring bars which take bearing

either in the work or in the chuck which holds the work. When tools get this steadying support directly on or in the work, they are freed from the chattering due to the machine mounting, but not free from that due to their own frailty or to the intermittent flow of the chip as it is taken off in chunks.

Relative Destructive Effects of Heat and Lateral Quivering.

The writer is not unmindful of the effect of heat in the destruction of the cutting edge, and fully realizes that no perfection of mounting of the work and tools will prevent destruction of the cutting edge of the tool by heat, but wishes to bring out the importance of the destructive effect of chattering which is ever present in standard types of machine tools. Heat is undoubtedly most destructive when roughing at high speeds, but the quivering plays a very important, if not the greatest part in edge destruction when finishing at the usual speeds.

Many machines are not run up to the high speed limit of the cutters. Even when provided with ample driving power, the strenuous life of attending a high speed machine is a little too much for the average man. As the speed is reduced, the quivering gains in relative importance, which should be taken into account in considering the no-clearance tool. With the slower speeds, tools should be used that give the best results at those speeds.

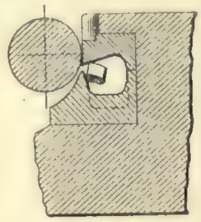
Clearance.

Since the birth of the slide rest lathe, in which the tool was first guided by mechanism, turning tools have been given clearance and it has been assumed that they would not cut without clearance. Of course it is well known that the orthodox lathe tool goes out of commission after losing its clearance, but that does not demonstrate that a tool cannot cut without clearance. It only proves that the present tools require clearance as they are now formed and mounted.

A tool which has been ground for clearance, and set in such a position that its under face is at an angle to the shoulder produced, presents but a small area to the shoulder of work when the clearance of the extreme edge has given way. The area is so small, compared with the stress of the abrading metal passing it, that it rapidly scores and wears into a rough surface standing at a "negative" clearance angle. A tool with a negative clearance and rough surface quickly goes from bad to worse.

The tool which has by chance been set in an engine lathe so that a comparative large area of the under face rides on the wall of metal does not wear away, because its surface is not subjected to as great abrading pressure per unit of area. Its area is sufficient to withstand abrasion.

It was assumed by the writer that increasing the contact of the under face of the tool against the face of the work would make it possible to cut without



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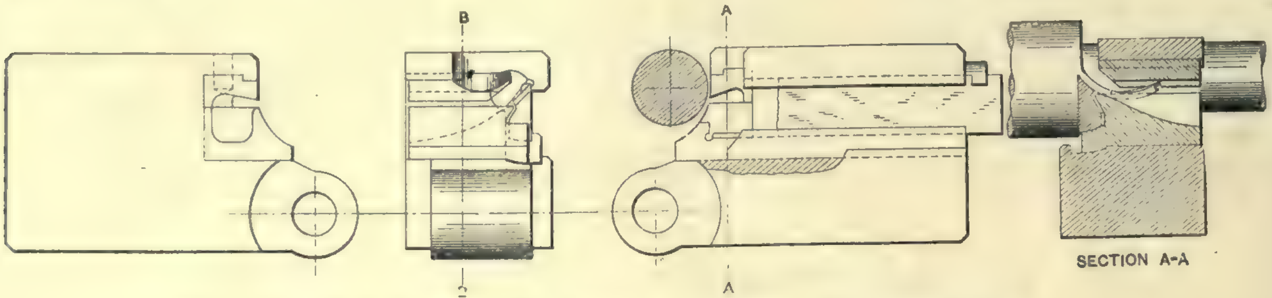


Fig. 6—Details of Turning Tool Showing Chip Breaker for a Curling Chip.

clearance. The advantage of a no-clearance tool is that its face rides on a good area and supports the under edge against the pressure of the chip, thus relieving the edge from the one-sided pressure which must be borne by a tool having clearance. This one-sided pressure may be wholly or only partly relieved.

No-Clearance Tool.

In order to enable the tool to ride flatly against the wall of metal from which the chip is being removed, we have mounted it to allow a comparatively free swiveling action on a centre line that is substantially coincident with the cutting edge of the tool When the tool is so mounted the pressure of the chip on the top slope tends to throw the so-called clearance face against the shoulder, for the mounting allows the tool to swing around to the angle that may be necessary to fit any work form, from a straight surface in planer work and the nearly straight surface in work of large diameter down to the angle of a helix obtained by the coarse feed on work of relatively small diameter.

A tool so mounted either swings automatically to adapt itself to angularity of feed, or may be swung by hand as soon as the cut is started. Its natural tendency holds it snugly against the metal, but the force may be varied from one that equalizes the stress on each side of the cutting edge down to a very slight stress which only holds the tool in no-clearance position. An important feature is that the tool is free to swing around to offset the unequal wear on the "clearance" face.

In the early experiments the cutters used were clamped rigidly in a holder, which in turn was pivotally mounted on a fixed holder. The cutting edge of the tool was so located as to stand exactly on the centre line of the swiveling holder.

In the later experiments the scheme has been simplified by loosely mounting the cutter itself, providing it with a round bottom struck from a centre line which is near the cutting corner of the tool. The cutting edge is usually standing at an angle to its centre line of swivel, giving the tool a front slope. The scheme of inclining the cutting edge to the line of swivel was adopted for the purpose of using a bar-shaped tool in which its shape could be maintained by grinding, for with this shape grinding back the end provides for the wearing down of the top edge. This gives the tool a front slope when the swiveling centre is kept horizontal. In some cases it may be well to tilt the holder to an angle that brings the cutting edge horizontal.

This departure from the ideal centre position of the line of swivel is not sufficient to cause any trouble. In fact, the pivotal line need not be exactly parallel to the cutting edge, neither is it necessary to have it very near the centre line of swivel. It is probable that under some conditions the cutting edge may advantageously be located either above or below or on either side of the cutting edge. The exact location of the cutting edge relative to the centre of oscillation partly determines the pres-

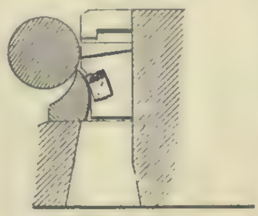
sure with which the tool rides against the wall of metal from which the chip is taken.

The extreme top edge of the tool, in some instances, has been slightly flattened on the acuter angles, the flat measuring from about 1-64 in to 1-32 in., and standing either 90 deg. from the so-called clearance face or sloping in either direction. Very good results were obtained by giving it a negative side slope standing at a maximum angle of from 10 deg. to 15 deg. from the horizontal. This top flat seems to make a good resting place for the false edge, and it may be that its successful operation is dependent on the false edge.

One interesting phase of these experiments has been the comparative willingness on the part of the tool to relieve the carriage of the duty of feeding. This first became apparent when the carriage continued to advance after the feed had been "thrown out." This self-feeding feature, of course, cannot apply to the action of planers, boring mills, or work of large diameter. It is mentioned here only to indicate the absence of resistance to the feeding motion under some conditions.

increase the tearing open or splitting effect which occurs in cutting metals. To increase the tearing action it is necessary to allow the chip, after it has passed from the edge of the tool, to pass over a lifter in the form of a wedge, either formed integrally with the tool or placed in the path of the chip near the tool, having an angle that not only assists in tearing the metal ahead of the tool, but also relieves the slope of the tool near the edge from an important part of the labor.

In other words, a chip possessing lateral strength made it possible to carry an important part of the cutting or splitting action farther away from the extreme edge. The heat generated by this part of the work, because of its



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are sometimes used to illustrate ideal working conditions of a machine require the constant attention of the operator, and either a very large receptable which doubles the floor space required for the machine or the almost constant attendance of an extra man for removing the chips from the room.

The use of the more acute angles increases the chip trouble, and may in some instances make it advisable to retain the blunt cutting angles, or, at least, tools which produce tolerable chips.

For turning bar work in the turret lathe it has seemed best to adopt a chip-breaker which produces a fracture by placing an obstruction in the path of the chip at such an angle that the chip is bent, either by lifting or depressing, or both, shortly after it has left the tool, to an extent beyond its breaking point. In order to employ the chip-lifter most efficiently for the purpose of relieving the top slope of the cutting tool, the writer has preferred to use a chip-breaker which depended on depressing the chip after it passed over the chip-lifting incline. A breaker of this kind breaks

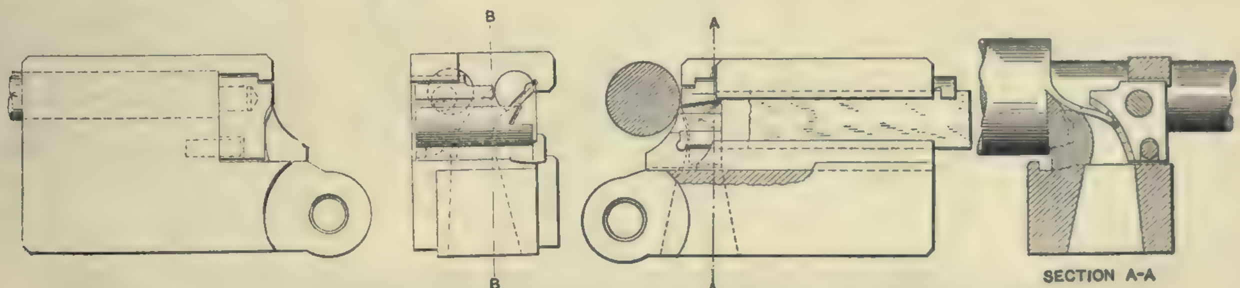

Fig. 7—Alternate Scheme for Chip Breaker for a Comparative Straight Chip.

The ultimate outcome of the use of acute angle tools may be to allow each tool to take a heavy cut on small diameters to determine its own feed. In the turret lathe this would be a distinct advantage.

Chip Lifter and Chip Control.

The chip produced by the acute angle tools is a continuous chip possessing great lateral strength. The continuous chip is preferred by any operator who has had experience with hot chips thrown off by tools of blunter angles, but while this particular feature enables him to observe the action of the tool closely without risk, the continuous chip in itself becomes troublesome, if allowed to run too long without breaking. In some of the first experiments with this tool, chips having a depth of about ⅜ in. and produced by a feed of six to the inch, were found exceedingly troublesome, especially when allowed to run out to lengths of 5 to 15 ft.

The lateral stiffness of the chip of the more acute tool made it possible to

position, of course in no way reduces the life of the extreme cutting edge. Experiments with the chip-lifting scheme seem to indicate that under ideal conditions the duty of the extreme edge of the tool may be simply to cut through metal which may be under more or less of a tearing or splitting stress.

Although this chip-lifting effect may be produced by a top slope having a curved surface, it has seemed best for the convenience of grinding the tool on an ordinary wheel to keep the top slope of the cutter a flat surface, and to introduce this chip-lifter as a separate member, either as a part of the tool holder or in conjunction with the chip-breaker to be described.

Although it is, as was stated, a satisfaction to be able to stand near the cutting tool and to have some assurance of the direction in which the chip will travel, and to know that it is integral and not shooting out in hot chunks at all angles from the tool point, a continuous chip is nevertheless troublesome. Even with blunt tools, the curling chips which

the chip in lengths varying from ½ to 3 in.

Conclusions.

The no-clearance cutter relieves the edge from the one-sided pressure.

It prevents lateral quivering.

It converts the lip angle into cutting angle, which for a tool of given form constitutes a gain of from 5 to 10 deg. in cutting angle.

It has extended the working range of the side tool which gives the minimum separating stress.

It has made possible the use of acute-angled tools which reduce the cutting stress, thereby increasing the output of machines which have been limited by lack of pulling power.

The reduction of the cutting and separating stresses has increased the accuracy (or output, which is generally interconvertible with accuracy) on nearly all lathe work.

This reduction also increases the output which has been limited mostly by the frailness or the slenderness of the work.

Machine Work on a Cream Separator, and Assembling Parts

Fine Work is one of the Prominent Features in Construction of Separators—Description of Work as Carried on by Petrie Manufacturing Co., Hamilton.

In the manufacture of cream separators the striking feature is the accuracy obtained in duplicating parts, especially the gears. Machines built especially for the purpose are used in their manufacture. The plant of the Petrie Mfg. Co., Hamilton, is a modern factory for the construction of cream separators, all of the parts, with the exception of the pressed steel bowl and ball bearings being made in Canada. The bowl is machined, however, in their own works.

Fig. 1—Molding Machine Work on Cream Separator.

One of the first considerations is to construct a strong frame with a solid foundation. This is necessary in this fast-running machine to reduce vibration to a minimum. The cast iron parts are all molded on Pridmore machines, a view of one being shown in Fig. 1. Fig. 2 is the magnet separator showing the construction.

In the frame, properly encased, is the spur or square gear shown in Fig. 2. It is the system found to work well for fast-running machines. The points of contact between the spur gears are direct, producing a rolling motion. A larger view of the ball race is shown in Fig. 3. This arrangement consists of a ball in the bottom of the ball race cup, around which five balls run. The spindle that rests on these balls has a hardened steel ball for its point. If this ball should become slightly worn in one place by inserting a nail in the drilled hole shown the ball can be revolved and a new surface subjected to wear.

Fig. 3—Spindle and Ball Race.

In tracing the work through the machine department the first operation is boring the frames in jigs carefully made by Brown & Sharpe. These are so constructed that a frame that does not fit either jig is thrown out. In boring the same high speed drills have been in use for three years, and there has been an output of fifty per day. The boring, milling and drilling department is shown in Fig. 4.

In the power presses, Fig. 5, the skimmers and other tin parts are shaped from steel and riveted by compressed air. The skimmers and the steel bowls are tinned so that there is no chance of rusting. In tinning these go through a process of caustic, water, sulphuric acid, muriatic acid and hot zinc. Four sizes of separators are obtained with the one size frame by changing the skimmer and bowl.

The gears are cut on Fellows' gear

Fig. 4—Boring, Milling and Drilling Department.

shaper, and two Brown & Sharpe's. The work is done with great accuracy as the gears run at 7,500 revolutions per minute. In Fig. 6 is shown the automatic gear-cutting machinery. A D. E. Whinton bevel gear cutter forms part of the equipment. The gears must be accurate from the first. They cannot be worn into shape, therefore the measurements must be exact.

Five Cleveland automatic, three Potter & Johnson, Pawtucket, automatic turret lathes, and six Jones & Lamson, Springfield, turret lathes, shown in Fig. 6, are used for small parts, and there is practically no variation in these parts. The machines are all built on concrete foundations and are rigid in construction. The gears are ground all over on two Landis grinders, with wheels furnished by the Canadian Corundum Co., running at 3,500 revolutions per minute. These wheels are soft and are used both for steel and brass.

The bowl is pressed in a large press costing about $14,000. The whole equipment for manufacturing separators is expensive, and for the manufacture of 50 per day a capital of $360,000 has been invested. It is the intention of the Petrie Mfg. Co. to instal one of these presses at a future date to manufacture the made in Canada separator.

The bowl of the separator is made of seamless steel tubing. In machining it, it is chucked and bored inside. It is then chucked on an expanding arbor and finished outside before it is removed from the lathe. By this method a well-balanced bowl is turned out.

In the assembling of the separator all parts are tested and the separator is run at full speed for some time. One feature is the unique patented brake. This is a strip of steel encircling the bowl and stops the machine very quickly with a very small pressure. This is a very effective brake and makes the equipment of the cream separator complete.

Fig. 2—Magnet Separator.

Fig. 5—Power Press Department.

WATER POWER.

The value of a developed water power is stated by Chas. T. Main, mill engineer and architect, of Boston, to be as follows:

"If the power can be run cheaper than steam, the value is that of the power, plus the cost of plant, less depreciation. If it cannot be run as cheaply as steam, considering its cost, etc., the value of the power itself is nothing, but the value of the plant is such a sum as could be paid for it new, which would bring the total cost of running down to the cost of steam power, less depreciation. That is, it is worth just what can be gotten out of the plant and no more."

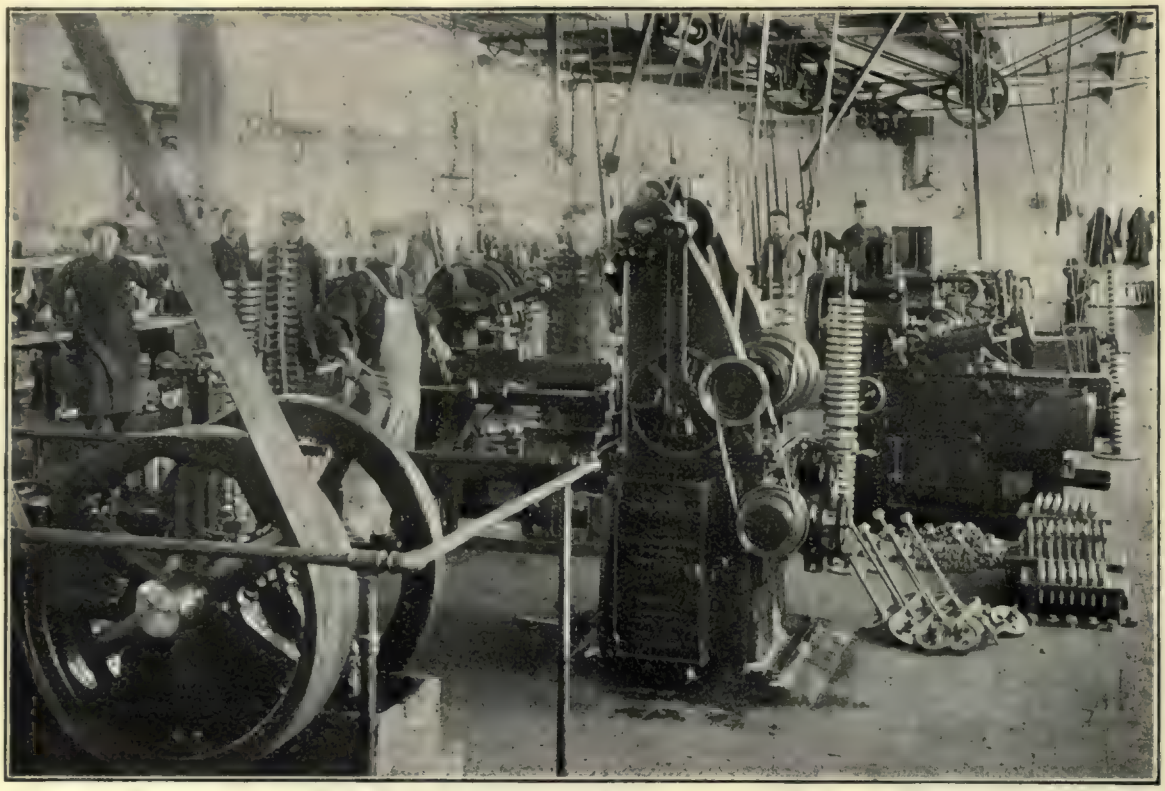

Fig. 6—Automatic Gear Cutting Department.

Fig. 7 —Automatic Screw Machine.

Accurate Cost Keeping as an Aid in Manufacturing

First Article of a Series on Cost Keeping, Illustrating from the System Now Used by the Canadian Locomotive Co., Kingston, Treating of the Necessity of Securing Accurate Cost Data and General Scheme Followed.

It doesn't seem necessary to argue the need of accurate cost-keeping. Every manufacturer should know the advantage of the cost department. In a complete system there are several branches usually divided into the heads, labor, material and overhead charges. To look after the cost of these are several clerks, a cost clerk, timekeeper and a store's clerk or stockkeeper, and in many establishments where the superintendent cannot attend to the buying, the office of buyer is added. In industries, where great quantities of a line of goods are manufactured the office of shipper is also added. In a locomotive works where two locomotives are shipped per week this office is not necessary, as it requires the attention of one clerk for only a few hours a week.

The general scheme followed by the Canadian Locomotive Works may be applied to any industry but in detail there are very many differences. In an agricultural works, for instance, there would be nothing gained by going into the detail necessary in a locomotive works, yet a complete system is required in both cases.

Time Keeping.

It is an easy matter to obtain the total number of hours worked during the day by a mechanic, but is more difficult to properly distribute the time on the various jobs on which a man may work during the day. In the early days it was customary for a foreman to carry a book in his pocket, containing a list of his men. Each day he marked the time a man worked opposite the man's name. For his information he had to depend a great deal on a man's honesty.

The next step in the development was to have a time clerk supplied with a large book, in which the time of a mechanic's entrance and exit were marked. It was then found necessary to have one door for the entrance and exit. In this manner the time-keeping department developed and with it the cost-keeping.

Object of Cost-Keeping.

The object of a good cost system is to do away with any off-hand estimates, to collect accurate data in regard to manufacturing operations and compare them with previous similar work. In this way the benefit of the system will be seen, an increased output may be obtained at a decreased cost. If a business has been unprofitable, the leaks may be discovered and eliminated. Another point is that increased business may be secured by judiciously lowering the selling price of the product.

The system should give within a reasonable time after the work is done, the actual and complete costs including every item of expense, the cost of each operation on each part of a machine and cost of erecting it. It should assist in the economical purchase of materials and obtain greater efficiency from the workmen by providing remuneration, through a cost or premium system for special individual work.

An illustration shows the efficiency and rapidity of finding costs with the system in use at the Canadian Locomotive Works. An hydraulic riveter was installed in the boiler department under contract. Mechanics from the Locomotive Works were employed in the erection and some material was used. The cost of this labor and material was to be deducted from the cost of the riveter. The work was finished one afternoon. The man in charge of the instalation entered the office and reported his work completed. He also said he would return in about two weeks when the company would have the counter account prepared and adjust the charges. He was told to come back in the morning before noon, which he did, and was surprised to find all the charges, both for labor and material, prepared. This was done in the regular course of working of the cost system. The man objected to some charges, but they were shown to be correct and the riveter was accepted. Had the matter stood for two weeks the differences might not have been so quickly and easily settled.

Unfortunately, some managers of works look upon a cost system as an added expense, overlooking the many benefits. By means of a cost system, if one department shows a loss, that particular department can be investigated and steps taken to trace and correct the cause. This is possible by comparing costs month by month, or, in case of locomotive works, the cost of one locomotive against another. This is possible, as locomotives are usually constructed in groups of five or ten under a contract number.

The system must be complete, yet simple, giving full information in regard to stock, etc., a system which shows any defect and its cause, and the quantity and quality of the work in the various departments. A manufacturer can then tell exactly how he stands, whether or not he will have a profit. Everything must be accounted for and the details of the business, coming to the direct notice of the superintendent, he is better able to keep the efficiency of the works to the highest point.

The Accounting.

The Canadian Locomotive Co.'s plant consists of offices, including the engineering department, pattern and carpenter shop, foundry, machine shops, forge shop, boiler shop, erecting shop and power plant. When an order comes for a number of locomotives the specifications and drawings are prepared in the engineering department. A copy of the specifications is sent to the stockkeeper who knows what material is on hand. The buyer is notified and he orders the material to fill the contract. If the prices are low, he buys a large stock of pig iron, bar iron and steel, etc., and if prices are high he orders only enough to complete the contract. The work then passes through the shops and the labor and material costs are carefully kept.

The total cost includes productive and non-productive labor, power, material, tools, depreciation, general office expenses, etc.

Productive labor includes all men employed in the actual work of production, machine men, fitters, erecting men, etc. Non-productive labor includes superintendents, foremen, timekeepers, errand boys, clerks, watchmen and laborers.

In the general office the expenses that must be taken into consideration are insurance, salaries, light, supplies, heat, telephone, taxes, etc. Other expenses are power, shop transmission, material and depreciation.

Shops occupying their own grounds and buildings are their own landlords and must furnish themselves with power, elevator service, watchmen, etc. The shop must pay real estate taxes unless they receive exemption from taxation, but, in any case, there will be school

taxes, water, insurance on buildings, repairs, power and heat.

In many towns plants receive exemption from real estate tax with the exception of the school tax for employing a certain number of men and paying out annually at least a certain fixed amount in wages. In some cases taxation is fixed and in this case the amount, depending, of course, on the rates of taxation, is added each year to the general expense.

The rate of insurance is a very variable one and depends on the quality and arrangement of the buildings, the contents, fire protection and watchmen's service. It is a good thing to have the building installed with automatic sprinklers. With a good fire service, the rates are much lower. It is better to expend the money in a good fire service than in heavy insurance rates.

There is nothing about the shop that will withstand the wear and tear, but everything must wear out. No matter how good a machine may be when placed in the shop, there comes a time when it is so useless that it does not deserve shop room. It is relegated to the scrap pile and is replaced by a new machine. Under different conditions, different lengths of time will be required to wear out the machine, but the end of the machine must come and the machine be replaced by one more modern and useful. The cost of the new machine cannot be changed to the particular year in which the change is made, nor can the plant be figured at its full cost value each year. What is done is this. The life of a machine is taken and its cost divided up into as many parts as there are years in the life of the machine. One of these parts is added each year, to the expenses of operating. Each of these parts is called a depreciation. The average life of a plant is from ten to twenty years, so that one-tenth to one-twentieth of the cost of the plant must be added to the running expenses each year.

Interest is the price paid for the use of money and discount means much the same thing. In the first case, when a manufacturer borrows money from a bank or from people who make a business of renting or loaning money, he must pay a good round sum for the use of it. There are few manufacturers who do not require ready money and as products are usually sold on thirty or sixty days' time or in the case of agricultural implements, six months' time, there are people who take advantage of these facts to offer to pay cash if allowed a certain percentage discount. These items must, therefore, be reckoned in figuring out the cost and added to the percentage allowed for general expenses.

Every manufacturing establishment requires a large amount of printed matter and to this should be added the cost of photographing, designing and preparing engravings and cuts. There is the cost of publishing catalogues and circulars and in addition there are used in large quantities, letter paper, envelopes, receipts, forms for the different departments, including the cost department, various books, pens, ink, blank paper, all of which add to the cost, although some items will be rather small.

In the case of oils and lubricants there are two costs to consider, the cost of the oil and the cost of the power to overcome friction. Now it is manifest that the latter is much the greater and that the cost of the oil is almost incomparable with the latter. Yet some manufacturers will save $1 in buying a cheap oil only to spend $100 in overcoming friction which might be easily overcome by replacing a good for an inferior oil. An extra dollar spent in lubricating the bearings with a good oil is money well invested, and often affects an appreciable saving in power, and, therefore, in the cost of manufacturing.

General expense accounts should be made up at stated periods, and added as a percentage of the productive labor. The cost of maintaining the engineering department and all non-productive labor is calculated in the same way.

A complete system of cards is in use in the Canadian Locomotive Works. It has many advantages over the book system. It is a system of rapid compilation. There is no lost time. If a superintendent wishes to examine the cost of any part, he can do so without stopping the cost-clerk's work. A premium system of rewarding men is also in use. Twelve clerks are employed in the carrying out of the time and cost system. Among the duties are to keep a record of all present and past employes, weight of castings, etc., and the cost department is, in reality, the superintendent's information bureau.

In the February issue will be described the Time-Keeping System, used by the Canadian Locomotive Co.; in March, the Paying System, and in April, the Material Cost and Summary. The forms used will also be given.

SHERARDIZING PRACTICE.*

By J. Everett Thompson.

Some data may now be of interest derived from experience with Sherardizing in the United States. As a method of rust proofing, Sherardizing is an excellent one. It is applicable in all cases where hot or cold galvanizing can be used.

The great importance of Sherardizing consists in the fact that in addition to a surface coating of zinc, an infinitesimal quantity of zinc is alloyed into the iron or steel and forms in itself a rust proofing that resists corrosion.

In many cases the articles need no special cleaning before being Sherardized. In others they are cleaned, as is done for ordinary galvanizing. Bolts, nuts, screws, stampings, bright plates, wire goods, etc., may be Sherardized just as they come from the machines without any further preparation or cleaning. Articles coated with grease or oil receive as good a coating of zinc as those which are free from it, if not better.

The Method.

The articles to be Sherardized are packed in a closed drum or bar in contact with the ordinary zinc of commerce. The drum is placed in an oven and heated to a temperature of about 700 degrees F. for 4 or 5 hours. It is then withdrawn and allowed to cool down to a temperature convenient for handling, when its contents are dumped upon a screen or grating which allows the zinc dust to fall through into a chamber below, from which it is drawn for use again. The cycle of operation is so simple that the most ordinary class of unskilled labor can be employed without fear as to the results.

Advantages.

By the gradual heating up, and then the gradual cooling down, the zinc dust being a poor conductor of heat, there can be no sudden high temperature. The extreme evenness of the coating in practice means that, however thick it may be, the sharpness of screw threads or the shape of stamped letters is preserved, and if sufficient clearance has been given, a Sherardized nut will run on a Sherardized bolt as easily and as smoothly as if it were not Sherardized, no recutting being required. Articles Sherardized and buffed may be used instead of polished brass or nickel plating. Since the protective coating is in the surface and not on it, it does not peel off as plating does. Sherardized plumbers' supplies are unequaled as to beauty of finish and length of life. In marine construction Sherardized metal ranks next to solid copper and brass in its ability to withstand corrosion. Chains treated with this process have remained in sea water continuously for nine months without showing any signs of corrosion.

It is hard to tell which is the more worthless: knowledge without energy, or energy without knowledge. Neither an engine without a train nor a train without an engine is making any money for the company.

* Articles on Galvanizing and Sherardizing appeared in January, August and October, 1908.

Co-operative Technical Education, with Examples*

The Need of Industrial Education for Mechanics in Manufacturing Centres in Canada—An Outline of Apprenticeship System of the Bullard Machine Tool Company, Bridgeport — The Co-operative System at Bridgeport.

The question has been asked, Why are Canadian mechanics so backward in acquiring technical education pertaining to their work? The reason is simply because the attention due this important subject has not been given to it by the Canadian Governments.

In Massachusetts a bill is now before the Legislature to establish an industrial college. The plan proposed by this Legislature includes extensive buildings, most modern shops, laboratories and other equipment, and a corps of instructors sufficient in number to train a large student body. The idea is to place the institution between the engineering school and local technical or trade schools. The students would be equipped to become superintendents and high-class foremen.

This system may work out all right, but it isn't what Canada requires at the present time. Canada is a growing country and education cannot be centered in one or two or three cities. The tendency in the case cited will be to raise the standard until the school is on a par with engineering colleges and Canada has sufficient engineering colleges at present.

The manufacturing centres of Canada are in urgent need of technical schools. Massachusetts has just enacted a law providing aid for free industrial schools, establishing the right of a resident of any city or town in the State to attend an industrial school located in any other community and compels his residential city or town to pay his tuition fee. This wholly logical provision is designed to meet the wants of the young people of places so small as to be unable to support schools of this character. It is intended as a factor in the plan of dividing the State into districts, each with its industrial school supported in part by the State. This is a plan worthy of being followed by Canada.

The principle of Government aid for schools of this character is an excellent one. Their benefits are far from local to the places where they are situated. The students go out into the world to use the results of their training wherever it will reap them the most benefit. Technical education is an essential part of the foundation of a country's future industrial welfare. Germany has recognized it and United States has done much and is doing much to establish industrial schools for mechanics.

Apprenticeship Systems.

Much can be done for apprentices while they are apprentices. E. P. Bullard, jr., president of the Bullard Machine Tool Co., gave a paper on "Industrial Training Through the Apprenticeship System," at the Atlanta convention of the National Society for the Promotion of Industrial Education, showing the many good points of proper apprenticeship systems.

Mr. Bullard combatted the idea that the apprenticeship system is dead, and stated his belief that no system of schools could completely take the place of shop training. He outlined a careful inquiry which he had caused to be made at the works of the Bullard Machine Tool Company into the comparative cost of the same pieces of work when done by journeymen and apprentices, the cost of 1,000 such pieces having been collected by the cost-accounting department. These had been analyzed and compared with the addition of the proper burden figured on the hourly burden plan, and the work of the apprentices had been found to be appreciably cheaper than that of the journeymen. This inquiry had been undertaken because the directors of his company did not believe apprentice labor to be profitable, or that the works could afford to employ apprentices, and the result of the investigation has been to change this belief.

He considered it necessary that the apprentice should be paid sufficient wages to provide for his support, that he should be given instruction in the technique of his trade, that an adequate amount of class room instruction should be provided aiming directly at the work of the shop, and that especially the apprentice should be taught the care of expensive factory equipment. The foremen should not be relied upon to teach apprentices, but a special shop instructor should be employed, as foremen have too many responsibilities and cares to make it possible for them to teach the apprentices.

Speaking of care of factory equipment, he stated his belief that 90 per cent. of the repairs required for metal-working machinery are due to the negligence and ignorance of their operators.

The apprenticeship system of the National Association of Machine Tool Builders is in use in the Bullard works. The terms of the regular apprenticeship, diploma and list of tools given to apprentices are here given.

Terms of Regular Apprenticeship.

TO

....

OF

....

MANUFACTURERS OF MACHINE TOOLS

And Member of the National Machine Tool Builders' Association.

1. Application must be made in person. When satisfactory, the applicant's name will be registered and due notice given when he is required to commence work. Applicant must be at least seventeen years of ago.

2. The applicant must, before commencing work, execute together with some responsible surety an agreement in the form hereto annexed.

3. A trial period of one thousand hours will first be required, after which, should the apprentice prove satisfactory, he will begin his term of service which will be three years of 2,900 hours each.

4. If during this period of trial an apprentice should, in the opinion of said company, prove deficient in capacity or unsatisfactory in deportment, notice to that effect shall be given to said apprentice and his surety and the contract of apprenticeship shall become absolutely void.

5. On completion of the trial period, the apprentice will be given the use of a new equipment of tools, which will be the property of the company; but on satisfactory completion of the term of apprenticeship, said equipment of tools will be given to the apprentice free of charge.

6. The wages of apprentices shall be as follows: For the first one thousand hours, or period of trial, and the first year, eight cents per hour; for the second and third years thereafter, ten and thirteen cents per hour, respectively, will be paid.

7. Wages will be paid on the regular pay days of the company as they may, from time to time, be established, except that the money earned during the trial period will be retained by the company until the apprentice shall have completed his term of service, when he will be paid that amount, unless it shall be forfeited as otherwise herein provided.

8. Lost time shall be made up at the expiration of each year, at the rate of wages paid during the said year, and no year of service shall commence till after all time lost by the apprentice in the preceeding year shall have been fully made up.

9. It is also expressly understood and agreed that at any time when from any cause whatsoever, orders shall fall off, making it necessary to shorten the hours of labor or close the

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* In March, 1908, appeared the G.T.R. Apprenticeship System; November, 1908, Industrial Course at Fitchburg; December, 1908, Urgent Necessity of Technical Education in Canada.

works or department, the said company reserves the right to suspend the force of apprentices wholly or in part, making payment only for the time actually worked.

10. The company will faithfully instruct the apprentice in the Machinist's Art or Trade in their shop, in .... during his said term of apprenticeship.

11. Applicants who may have served terms of special apprenticeship, or who may be graduates of Technical Schools, shall be entitled to such credit of time on period of service as regular apprentices, and an increase in wage rates, as may be mutually agreed upon.

12. Apprentices will be required to perform their duties with punctuality, fidelity, and diligence, and to conform to the rules and regulations which are or may be adopted from time to time for the good government of the shop; and the company reserves to itself the right, at its sole discretion, to terminate the agreement and discharge an apprentice from further service, for any unfaithfulness, non-conformity with such rules and regulations, want of diligence to his business, or improper conduct in or out of the shop. In case of such discharge, or in the event that said apprentice shall abandon his apprenticeship before the expiration thereof, without the consent of said company, the apprentice shall forfeit all wages then earned and unpaid, together with the money earned during the period of trial, retained by the company as a guarantee of good faith.

DIPLOMA.

This is to Certify that .... has served full term of Apprenticeship in acquiring the Art or Trade of Machinist, and is fully instructed in all branches of said Art or Trade at the works of ....

In witness whereof we hereunto set our hands and the seal of the National Machine Tool Builders' Association, this .... day of .... 19......

.... President.

(Seal)

.... Secretary.

Tools Given to Regular Apprentices.

- 12 in. Surface Gauge, No. 57, 3½ in. base.
- 12 in. Combination Square Set, No. 23, with centre head.
- 1 lb. Hammer.
- 12 in. Scale No. 2 graduations.
- 6 in. Scale No. 4 graduations.
- 4 in. Scale No. 4 graduations.
- 10 in. Monkey wrench.
- 6 in. Stiff Joint Caliper, outside and inside.
- 9 in. Stiff Joint Caliper, outside and inside.
- 1 in. Micrometer.
- 6 in. Divider.
- 6 in. Hermaphrodite.
- 2 in. Centre Punch, large and small.

Necessary tools not included in the above equipment will be supplied from the shop tool room, on foreman's order.

During the fall of 1908 an innovation has been made in Bridgeport. Many of the most important manufacturers in this city have, working in co-operation with the local Y.M.C.A., established a day school in the Y.M.C.A. building under the supervision of a special instructor, and are sending their apprentice boys for two hours a day, five days a week, to the class room to receive instruction in the branches of study allied to the machinist trade, such as arithmetic, etc.

These boys are paid for the time they are in the class room, and through their increased knowledge they will be able to repay the employer by their increased earning capacity.

The school was started at the instance of Mr. Jeremiah Holmes, industrial secretary for the Y.M.C.A., working in conjunction with the Industrial Education Committee from the Manufacturers' Association. Mr. Broadhead, a graduate of Lehigh University, and until recently an employe of the Bethlehem Steel Co., was engaged as instructor.

The expense of maintaining the school is defrayed by the tuition received from the students, which is in all cases paid by the manufacturer who sends the boy to the school. The boys are all apprentices working in factories throughout the city.

Mr. Broadhead has placed the boys in classes according to their ability. The manufacturer is furnished with a report giving the progress the boy is making in school. No boys were given this opportunity who had not at least two more years to serve on their apprenticeship contract.

Details of Work.

Apprentices will pursue their shop work as at present in the factories where they are under contract. The class room work is given in the Y.M. C.A. building, to which the students proceed for a two-hour period for either three or five days a week as the manufacturer may elect. These two-hour periods may be assigned to commence or terminate with the regular hours of work at the factory. This affords a minimum of lost time in going to or from classes.

The classes will be in charge of competent instructors especially qualified, and engaged solely for this work. Owing to the lateness of the season, it has become necessary to limit the course for the first year to 30 weeks. In view of the somewhat short season, it is obvious that the five-day plan is desirable, if not essential, to a fair test of the system during the first year. The shop work is assigned to the charge of a capable employe already on the factory pay roll, who supervises the work of the apprentices under his care, and familiarizes himself with the general lines which the instruction follows.

The cost to the manufacturer will be a natural charge for the development of apprentices. At Lynn, where the General Electric has successfully used this same system, this has turned out to be —in dollars and cents—one of the most profitable departments of the works, as the increased value of the apprentice from day to day as an employe in the manufacturing departments much more than offsets the expense. The instruction expenses are divided among those making use of the system, and for the first year the charge is approximately $20 or $30 per apprentice, according as the three or five-day-per-week sessions are used.

This co-operative system is practically identical with that developed by M. W. Alexander, at the General Electric Works, West Lynn, Mass., with great success. At West Lynn, over $200,000 have been spent in buildings and equipment. By making arrangements with the Y.M.C.A. the manufacturers of Bridgeport have eliminated this expense. Later on, however, it is hoped that the Board of Education will be in a position to establish a separate institution for this work.

The apprentices at the General Electric Works, receive $5 a week, being paid for the hours spent in study as well as the time spent in the shop. The class room work forms the keystone of the successful performance of the system and is given in a central building over a mile distant from portions of the plant. The two-hour periods at West Lynn commence or terminate the day's work as assigned and afford a minimum of lost time.

The February issue will contain further comments on, and other examples of, technical educational courses for mechanics. It will also review the conditions that exist in some shops and show how they may be eliminated by establishing courses in technical education.

INCREASED RESPONSIBILITY.

Uncle—"What's that, my lad? you tell me your employer has forced an interest in his business upon you, and you only with him six months?"

Nephew—"Yes, sir; he said if I didn't take an interest in the business, I'd have to get out."

AN UNUSUAL TYPE OF DREDGE.

This article on page 38 of December issue, 1908, Canadian Machinery, was contributed by George Johnson, Arnprior, who designed it.

A NEW JOINTING CEMENT.

A new cement, Hawkins' "Imperishable," is being put on the market by Bain & Mitchell, Montreal. The application is simply made by mixing the cement to a stiff putty with a little boiled oil. Corrugated rings are not needed and no hammering or chipping is required to bring pipes apart after use. Pressure can be immediately turned on in any pipe line, etc., as soon as cement is in place, and flanges screwed tight. The cement is put up in tins in four sizes, viz., 14, 28, 56 and 112 pounds.

MACHINE SHOP METHODS AND DEVICES

Unique Ways of Doing Things in the Machine Shop. Readers' Opinions Concerning Shop Practice. Data for Machinists. Contributions paid for.

NEW SCREW MACHINE COLLET.

By D. F. Kalish.

The sketch shows the front end of the spindle, the rear end being the same as the ordinary screw machine spindle and is not necessary for this description.

"A" is the spindle and the front end, only, is hardened and ground inside and outside. The hole being made taper to insure a good fit of the piece "B" without much fitting.

"D" is the collet, tool steel and is made up of three pieces, as shown in the detail, and requires no grinding. The hole is reamed .005 smaller than the size of the stock to be held. It is finished turned from the hole and is then gripped endwise in the milling machine vise and slotted clear through. The hole is relieved in the middle of the collet by filing straight across as shown in the detail. The taper part is relieved as also shown in the detail, leaving a bearing about one-eighth of an inch wide on each section of the collet, giving a narrow bearing which enables the collet to hold smaller sizes than the size for which the collet was originally made.

"C" is the closer and is made of tool steel, hardened and ground inside and outside. The point where it bears on the collet should be as far forward as possible so that the collet will have a good hold when the stock gets near the end of the bar.

"E" is the feed chuck and the hole is made about .005 larger than the stock and is tapped in the rear end for the feed tube, instead of the thread being cut on the outside, making the piece simpler to make as it then can be turned one size on the outside.

"F" is the feed tube, which is made the same as the ordinary feed tube in most screw machine spindles, excepting that the front end is turned down and threaded.

"G" is the push tube and should have a good bearing on both ends to enable it to butt straight up against piece "C."

"H" is the spindle cap, machine steel which holds piece "B" back to its proper seat in the spindle and has holes (not shown) for screwing up with a spanner wrench.

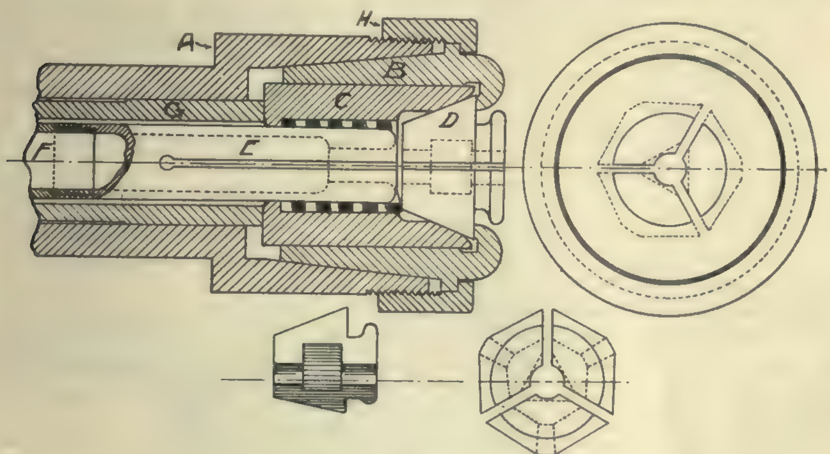
New bars of stock may be put into the machine without stopping it and stock can be used right down to the end, saving considerable waste. Just before feeding, the push tube "G" recedes and the spring forces the closer "C" back. Centrifugal force then opens the collet and it stays open until push tube "G" is moved forward. The spring keeps the collet straightened up against the piece "B" at all times and the piece "C" when moved forward forces the collet to close down upon the work.

The spring was made of rectangular section on account of the small space which was available between the feed chuck and the closer.

There was no trouble from small chips working back into the slots, the o l flying off the rim of the collet carrying the small chips off with it.

The fact that the collet is always held in a forward position by the spring there is no end variation in the pieces being made, as caused by the movable collet in the ordinary style.

Several spindles designed and built this way have given excellent satisfaction as to the accuracy of the product and its advantages as to ease of making and superiority over the old style are obvious by the drawing and description.



Screw Machine Spindle.

PRACTICAL HINTS ON TOOL STEEL

By Wm. M. Preston.

This article is intended to treat on the practical and every-day methods of working tool steel in a plain and simple manner. It is comparatively easy to secure good results from plants especially made; where expensive registering instruments record the various degrees of heat required. Concerns with these facilities, however, are the exception, and not the rule. Therefore, these hints are intended for the average Canadian workshop, where only the ordinary facilities are found.

One of the most essential points to be remembered is, that steel is extremely sensitive to heat, and while it is in a heated state, great care should be taken that the heat either increases or decreases in an uniform manner. The former applies to hardening and latter to annealing.

It is an undisputed fact that those who have to do with steel have trouble in a greater or lesser degree. Chiefly in the greater degree.

Some mechanics expect to loose a small per cent. of a batch of tools in hardening. Does it seem unreasonable to expect that a batch of tools be put through the hardening process without any losses whatever? If ninety out of one hundred can be put through successfully in this way why not the remaining ten pieces? It is safe to reason that if the conditions are favorable for 90 per cent. the other 10 per cent. can also be done in the same manner if care be taken. Therefore there are mechanics who work daily on steel, who do not lose one piece out of 1,000, either by over-heating or cracking.

In some instances it is very natural to expect losses. Small shops usually have one or more smiths who do the forging, welding and various other kinds of work. To expect a smith who has but recently made a weld, to harden a tool and not spoil it, is unreasonable.

To avoid losses along these lines, a man must not be permitted to weld, if he is to harden. The welding heat is so intense that it destroys the faculty of the eyes to rightly distinguish a proper heat for hardening, and, therefore, heats taken under these conditions are usually too high which destroys the steel, even though it may not crack or warp.

Steel manufacturers are unanimous on this point; or more properly speaking, on this rule. "Best results are obtained by hardening at the lowest possible heat at which steel will become hard." Facilities for heating have a great deal to do with the success or failure to secure results. However, with even the ordinary forge, the most gratifying results may be obtained, if a little care and judgment is exercised.

With a few fire bricks at hand, the ordinary forge may be quickly converted into a temporary hardening oven. The bricks may be built up loosely into a rectangular form, large enough to accommodate the work at hand. After an ample pit has been allowed for the fire, place a fire-clay slab or cast iron plate over same, so that the work does not come in contact with the fire. Then build up one or two bricks higher for oven in which to place the work. By covering the top over, and closing the front as much as possible, the job is complete. Fine coke, or nut coal is more adapted for firing than forge coal, as they are cleaner and last much longer.

Large and ample fires are very essential, so that the heating may be done with a minimum blast. This insures even and uniform heats and avoids overheating.

The hardening bath should be of liberal proportions. Not too small. This does not necessarily need to be composed of some secretly prepared solutions. A good strong salt brine is equal almost to any solution known. Of course for difficult shapes and irregular small pieces, oil is preferable.

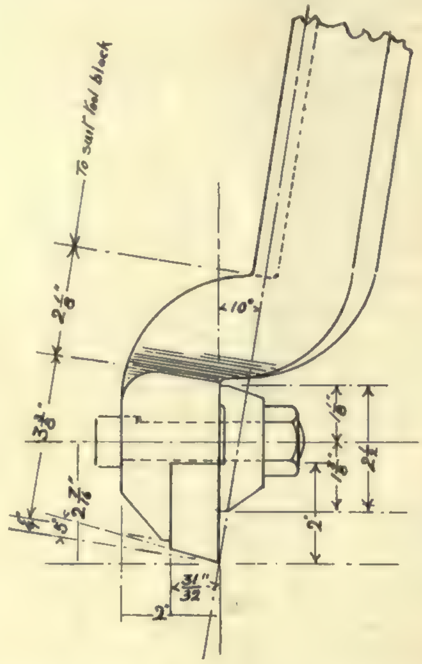
It might also be well to note that good results are not obtained by "plunging" heated tools into the bath. Care should be taken to immerse the tools slowly into the solution. The way a piece is immersed usually determines whether it shall be warped or straight when it is cooled.

Hardening solutions should be kept absolutely free from oil and grease, and ought to be securely covered when not in use.

Tempering the same as a great many other theories and practices has been revised somewhat in recent years. Many and varied are the methods used. But for all ordinary purposes, the old method of drawing the temper to color is a very satisfactory and simple way of securing good temper in tools. On articles which have a rough surface, the color is harder to distinguish than on articles that have a smooth or polished surface.

Good tempers are secured by slow uniform heating. When the desired color is obtained the piece may be immersed in oil for about 5 or 10 seconds, and then withdrawn, to be cooled off in the air.

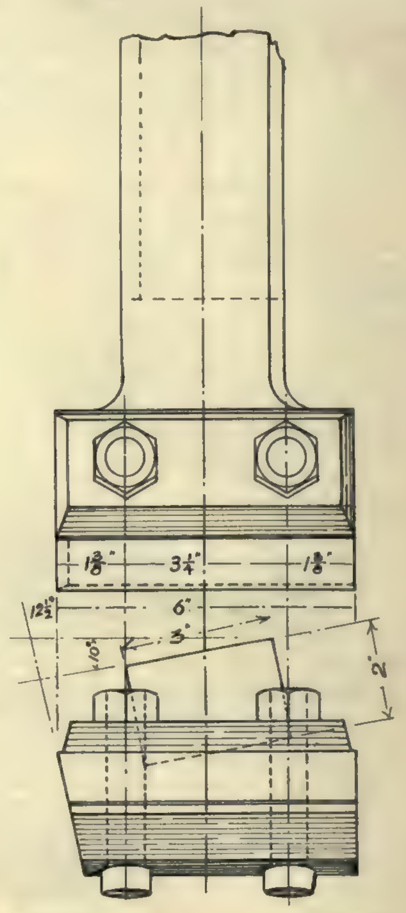
Annealing like hardening and tempering should be done in a very careful way. If for expensive tools it is well to seal up pieces so that the air does not reach them during the process. The heating like the cooling must be done evenly and slowly to secure the best results. It is often necessary to anneal several times in order to eliminate all internal strains in the material, so that the pieces may harden and retain their original shapes. This, however, is not usually done unless the tools have dimensions varying considerably in size. If the steel is treated carefully, almost any desired results may be obtained.



A FINISHING TOOL FOR THE PLANER.

By R. H. Wadsworth.

The finishing cut in planing is usually taken with a tool having a broad cutting edge, usually about 1½" on the larger machines. Such a tool permits a feed of about 1" per stroke of the planer. The accompanying sketch shows how a tool was made permitting a feed of 5" or 5½" per stroke. Such a tool is of advantage on large planers especially, where the time required by the planer in backing is sufficient to allow the operator to move the saddle 5" by means of the feed screw. We found it very profitable on an 8 ft. by 8 ft. planer. The tool gives results as satisfactory on multiple work, where the cutting is intermittent, as when the cutting is continuous. The feed marks remain very apparent but do not show an unevenness of over .0005". The shank or holder of this tool is forged from steel and machined as per the sketch. Two ¾" turned bolts fit closely in the holder. A case-hardened steel washer fits loosely over the bolts. The cutter is a piece of 2"x1" high-speed tool steel, ground so that it bears well in the holder. This tool



Finishing Tool for Large Planer.

may be designed for 1½"x1" steel if such is readily obtainable. By having two such cutters no delay need be experienced while one is at the grinding machine.

This tool turns off a large chip and leaves a smooth, bright surface. A cut as deep as .006" and deeper, may be taken if necessary with satisfactory results.

AN INTERESTING EXAMPLE OF CONTINUOUS MILLING.

The drawing herewith shows the outline of a small machine part, which requires that one of its surfaces be machined flat. This is the simplest kind of machine work, and is the sort of a job on which most well organized shops

would be prepared to make exceptionally good time.

However, by all of the usual processes of machining, even when the work is done on a miller, there must be a certain amount of time allowed the operator for chucking and handling the pieces. Unless the fixtures are made very convenient, this amounts to a good deal more than the time required for the actual machining. The fact is that the modern high power, conveniently arranged, miller does the actual milling very much quicker in a majority of cases than is possible for the operator to handle the work.

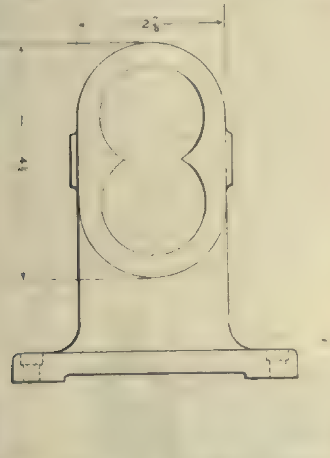


Fig. 1.—Piece to be Machined.

On all such work which can be handled and chucked as quickly as the milling can be done, it is obviously of the greatest advantage to so arrange fixtures that the operator can be chucking one piece while the machine is milling another piece in the same fixture.

In view of all these facts, the accompanying half-tone illustrations will be of particular interest. It shows a No. 2 vertical Cincinnati high power miller, fitted with circular milling attachment, and a special circular fixture arranged to hold eight of these pieces. Each piece is clamped independent of the others, and the fixture is arranged so that the clamping and removing of the pieces can be done in the quickest possible time—so quick, in fact, that an operator can keep the fixture constantly filled with pieces to be milled, while the machine continues in operation without stopping.

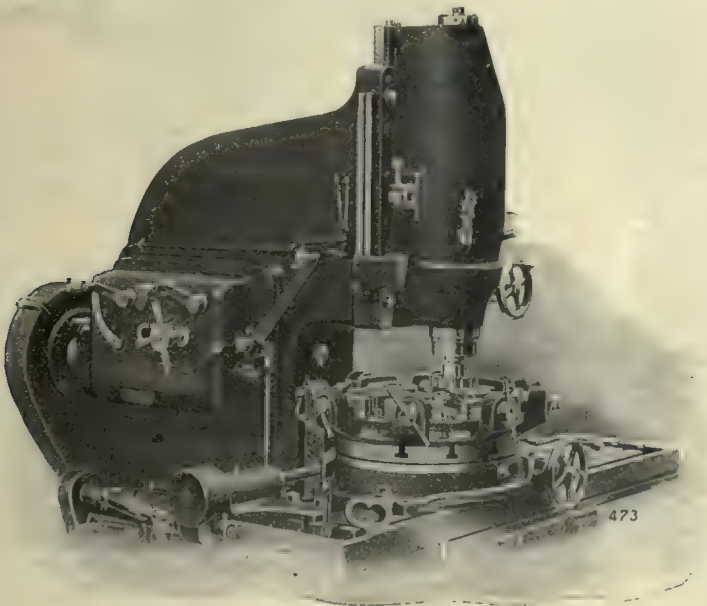


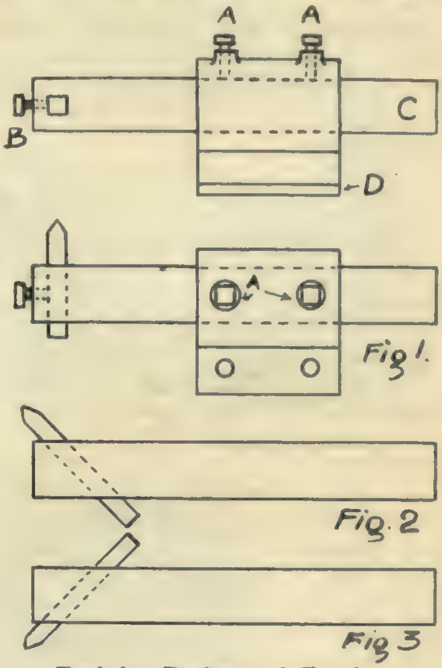
Fig. 2.—Vertical High Power Miller.

It has been found that if the fixture is revolved continuously at such a rate as to pass 220 pieces under the cutter in an hour, the operator will be able to handle this same number of pieces, that is, he will be able to chuck new ones and remove the milled ones at this rate. The operation, therefore, becomes a continuous one. There is no time lost for returning the table, no time lost for chucking the pieces. The rate at which the work can be done depends entirely on the agility and willingness of the operator. For a man of less than average ability the machine can be slowed down so as to enable him to have just sufficient time for his part of the work, while on the other hand an operator of more than average ability could speed the machine up. This same method of milling applies to a variety of small machine parts.

TOOL FOR BORING AND TURNING.

In Fig. 1 is shown the arrangement of the tool for boring. A square hole is made in a bar of round steel, the size depending on the size of tool required. The cast iron holder has a boss D fitting into tool rest and is bolted to it. A, A, tighten the bar in holder and set screw holds the tool in place. This tool may be used for boring or threading.

If there is a shoulder it is necessary to cut the hole slanting as in Figs. 2 and 3. The tool in Fig. 2 is for turning and Fig. 3 boring to a shoulder. To get the position 3, reverse the steel bar in the holder and then reverse the tool.



Tool for Boring and Turning.

CASTINGS TRUCK.

The truck shown in the accompanying line cut is used in an agricultural implement works in connection with their castings department. When the castings are sorted they are put in these steel barrels. Supports on the truck fit the trunnions on the barrel and the barrels of castings are easily moved from one place to another. The economic feature is that one truck is all that is necessary. As each barrel is filled it is moved to the storage bins or to the machine shop if there are machining operations to be performed.

Castings Truck.

TO REMOVE RUST FROM STEEL.

Brush the rusted steel with a paste composed of ½ ounce cyanide of potassium, ½ ounce castile soap, 1 ounce whiting and enough water to make a paste. Then wash the steel in a solution of ½ ounce cyanide of potassium in 2 ounces of water.

DEVELOPMENTS IN MACHINERY

New Machinery for Machine Shop, Foundry, Pattern Shop, Planing Mill; New Engines, Boilers, Electrical Machinery, Transmission Devices.

McDOUGALL 16-IN. ENGINE LATHE

The headstock is well ribbed and closely fitted. The bearings are made self-oiling, having deep chambers for this purpose.

Tailstock of the overhanging pattern is furnished, which permits the use of compound rest at right angles when turning short centres. It can be set over and the clamping of the sleeve is accomplished by a new device consisting of a two plug clamp which effectively locks the sleeve.

Bed is of extra weight and depth, with unusual thickness of metal, webbed in two-foot sections, and will not spring under the heaviest cut. Spindle is made of high carbon hammered steel bored from the solid, accurately ground, and mounted in solid chilled cast iron bearings accurately machined and scraped to perfect fit.

Carriage and apron have been designed with special reference to giving the maximum resistance to the springing and straining of these important parts of a lathe. The carriage has full bearings on V's its entire length, has wide cross V reinforced with an extra amount of metal in cross bridge.

Compound rest is fitted with taper gibs which are adjusted from the end, carefully scraped to slide and has graduated base. Screws both on compound rest and cross slide are graduated reading in thousands.

Feeds both cross and longitudinal are engaged by friction and a safety attachment is provided which prevents screw and feed being engaged at the same time. There are three quick changes on the gear box at the head of the machine, which gives a ratio of 1¼, 2½ and 5 times any thread which may be in use at the time. The feed of the apron is also reversed in the apron.

For screw cutting an indicator is provided on the side of the carriage which renders it possible to cut single, double, triple or quadruple threads without a reversing belt being necessary, for with this attachment the thread may be taken up at any point, thus leaving the second pulley on the countershaft available as another change speed.

Gears and racks are all cut from the solid. Racks are all steel and gears wherever necessary are made from the same material.

This lathe is manufactured by the R. McDougall Co., Ltd., Galt.

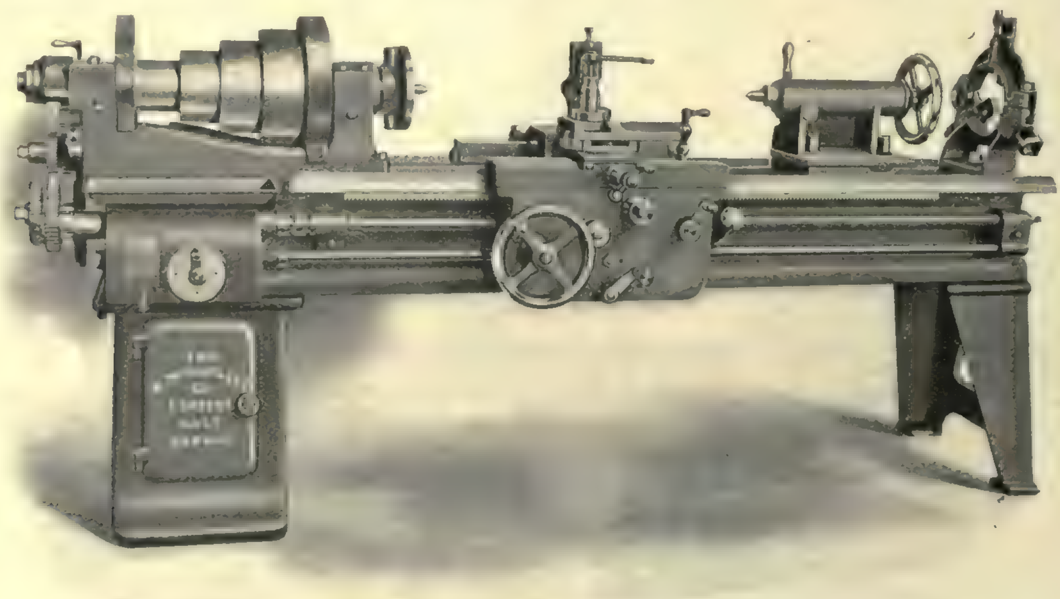
The head is made with the new design three-step cone and double back gears, the cone is of good width, and diameter.

There is a belt shifter furnished, both on the head of the machine and countershaft, quickly changing the driving belt from one step to the other, by this means the belt can be changed as quickly as the ordinary change in speed by means of slip gears, etc. The change between the two sets of back gears is also operated by means of a lever, which puts all the changes in speed under the instantaneous control of the operator.

The head spindle bearings are solid with the head, being cast on chills which give a very close bearing material, and are afterward machined to a perfect fit for the spindle. These are adjustable and are furnished with a positive oiling device, which keeps a flood of oil in the spindle bearings. This makes practically an everlasting bearing.

The different changes of feed and screw cutting, of which there are fifty, are instantly obtainable by the movement of one, or two, levers. This permits of a heavy roughing cut at a fine feed, and a lighter finishing cut at a coarse feed, getting out of the high-speed steel all that it will stand. It is also of advantage in that it takes no longer to change from feeding to thread-cutting, than from one feed to another.

The automatic cross and longitudinal feeds, which are reversible in the apron,



McDougall 16-inch Engine Lathe.

McGREGOR-GOURLAY LATHE.

The illustration shown on the following page is a new style of engine lathe recently put on the market. It is intended to do the regular work, required of an engine lathe, and give satisfactory results when used as a high speed lathe.

are gear driven from the spline screw through friction clutches, which give a maximum feed, and at the same time provide against breakage from accident.

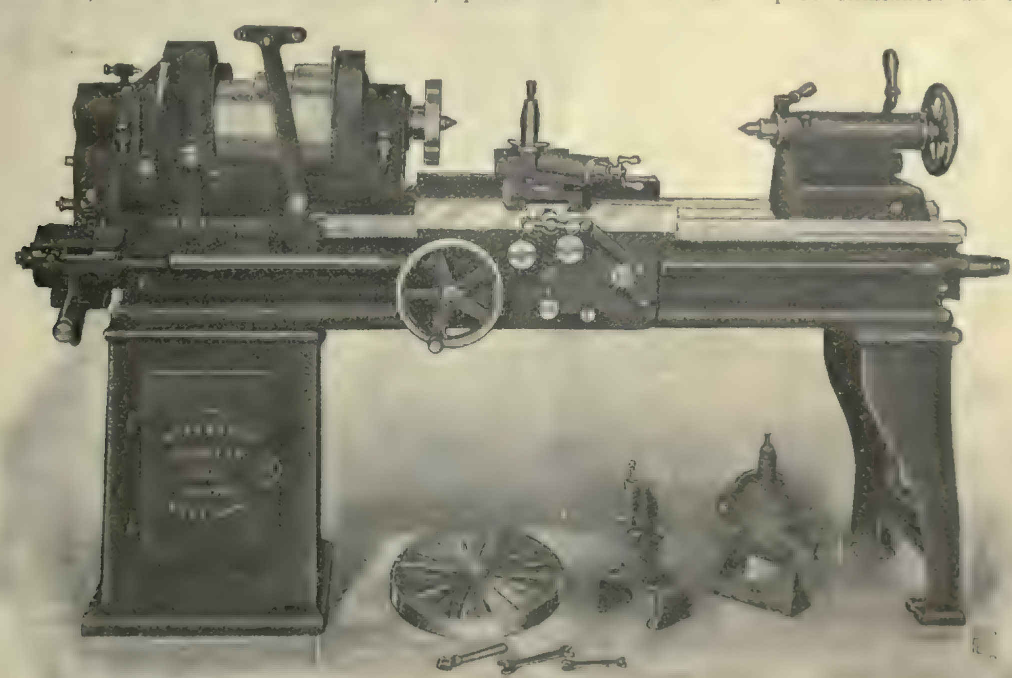
The thread on the lead screw is used only for screw-cutting, and it is impossible to engage the nut for screw-cutting and the feeds, at the same time. By the movement of a lever, the saddle is clamped to the bed when cross-feeding.

The hub of the hand wheel which governs the movement of the saddle as well as the handle of the cross-screw, and the screw of the compound rest have micrometer graduated collars. These collars are graduated, both in thousandths and sixty-fourths of an inch.

The tailstock is made off-set to accommodate the compound rest, and is clamped to the bed, by means of the handle shown, which stands directly in front of the operator. The sleeve of this tailstock is also graduated in fractions of an inch, which is useful in boring. The cross adjustment is also graduated.

There is on the top of the saddle, a small dial, by means of which it is not necessary to reverse or stop the lathe in cutting screws. The nut is thrown out, the saddle returned by hand, and as the dial is passing the zero mark the nut is again thrown in, which catches the proper thread. This permits of the two friction pulleys on the countershaft being both run in the same direction and gives eighteen speeds to the lathe spindle, which are arranged in geometrical progression, and, as before stated, any one of these speeds is practically instantly obtainable.

This machine is manufactured by the MacGregor-Gourlay Company, Limited, Galt, Ont.

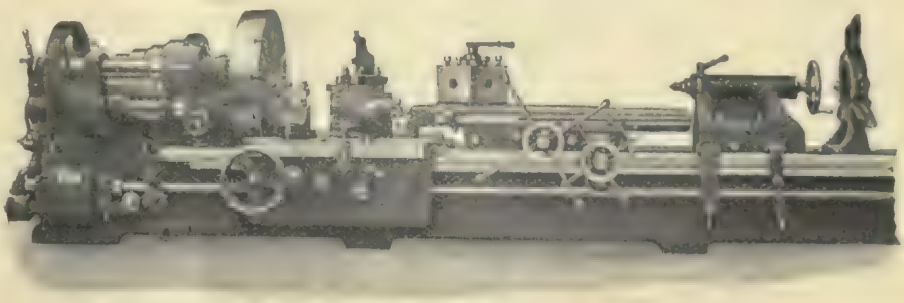


New Style McGregor. Gourley Engine Lathe.

HEAVY PATTERN AMERICAN LATHE.

This lathe is equipped with triple-geared head and turret on shears and is of good design. It is steel geared throughout and of very heavy construction.

The back gears are automatically disengaged when slipping pinion into internal gear and vice versa. Longitudinal feed of carriage is controlled by a friction, and the cross-feed by a sawtooth clutch, operated from "star" handle on the apron, which is cam actuated. Rack pinion in apron can be withdrawn while thread cutting. Feed box, on front of machine beneath head stock, supplies three instantaneous changes for feeding and screw cutting, for every change of gears on quadrant at head end of lathe.



Heavy Pattern American Lathe.

The turret is equipped with new indexing mechanism, which is self-compensating for wear. This mechanism is located at the front of turret top-slide.

Turret can be tripped or revolved automatically or by hand. The mechanism can be set so as to be inoperative, when wishing to run the slide back to extreme limit, without withdrawing the locking-pin or revolving the turret. This is accomplished by the small lever shown near the large pilot wheel. The turret top-slide is supported on its outer end by a gibbed bracket attached to the front of the slide which travels along the V's of the bed and through its support eliminates all tendency to spring under a long reach. The bracket can be removed should the work require that the turret slide pass over the carriage of the lathe.

The bottom-slide of turret is moved along the bed by the pilot wheel shown

at rear end. It is clamped to bed by two eccentrics, one at the front and the other at the rear end. It is further secured from slipping, due to severe end-thrust, by a pawl, which, dropping from the turret, engages a ratchet-toothed rack cast in the centre of the lathe bed.

Eight well selected feeds are supplied to the turret, ranging from .005 in. to .162 in., which are entirely independent of the regular carriage and apron feeds. Turret feeds are controlled by the two "star" knobs, carrying index dials, which are shown one directly above the other on the front of the bed near the feed box. The dials and pointers thereon, indicate at once the feed in inches as set, and all changes can be made while the lathe is running. The "star" knobs operate through shafts, extending through the bed to the quick-change turret-feed-box at the rear of head-stock, which is provided with a neat and substantial cover.

Provision is made on the compound rest slide to quickly attach the turret top-slide to same. This is very valuable when wishing to impart to the turret the feeds of the carriage, such as in large tapping operations. In such a case the taps get a "positive lead," since the screw-cutting mechanism can be engaged in the apron and the proper lead thereby transmitted to the turret slide, carrying the tap. This feature is also of value in ordinary jobs of chasing internal threads with a turret tool.

Feeds of turret can be reversed when wishing to "back face" or "counterbore." Reversal of feeds is controlled by the lever, conveniently located on driving sprocket of quick-change turret-feed-box. The taper attachment is equipped with vernier for fine adjustment.

This lathe is manufactured by the American Tool Works Co., Cincinnati.

KNURLING TOOL FOR LATHE WORK.

The knurling tool is shown in the accompanying illustration.

Exclusive of the rolls and pins, it is composed of but two parts—the shank, and the rocking holder for the rolls. The holder fits into a tongued and grooved circular seat in the shank, being retain-

Knurling Tool for Lathe Work.

ed in place there by a pin passing through a circular groove in the tongue formed on the shank. The holder is thus free to swivel when brought in contact with the work. This method of self-centering gives practically no lost motion, and the joint has ample bearing to resist the strains of both end and side thrust.

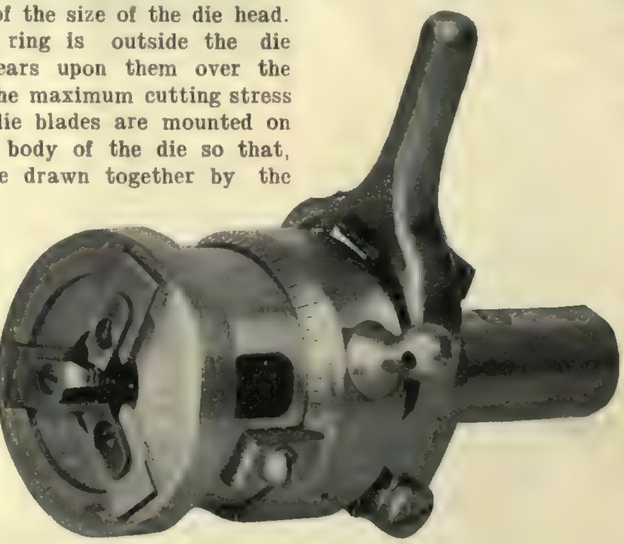
This tool is furnished with either coarse, medium or fine knurls. The knurls and pins are made of hardened tool steel. The other parts are drop forged or bar steel, hardened.

The knurling tool is made by the Armstrong Bros. Tool Co., 113 N. Francisco Ave., Chicago, Ill.

AUTOMATIC DIE HEAD.

Several new features are incorporated in the Diamond automatic die head. These are the arrangement for discharging the chips from the die head ; method of overcoming unequal wear on the cutting blades or chasers ; greater range of diameters of work to each size head, and decrease of the size of the die head.

The closing ring is outside the die blades and bears upon them over the point where the maximum cutting stress comes. The die blades are mounted on pivots in the body of the die so that, when they are drawn together by the



Automatic Die Head.

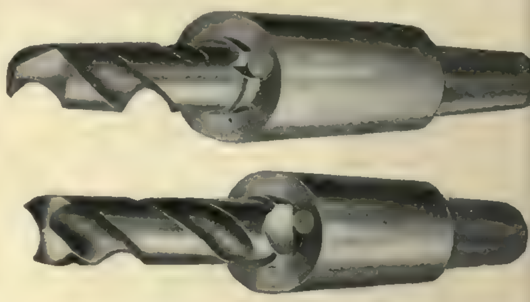
closing ring, the outer ends of the blades, where the heaviest wear occurs, are closed in faster than the portions nearer the pivots, thus compensating for unequal wear.

Large openings are provided through which the chips are flushed by the lubricating oil. An internal stop pin trips the die. On the reversal of the turret the die may be closed either by hand or by a small, easily made cam secured to the turret slide and bearing on the closing lever on the backward motion of the turret.

This automatic die head is manufactured by the Diamond Power Specialty Co., Detroit, Mich.

STAY-IN DRILL SOCKET.

The main advantage of this drill socket is the fact that they hold the drill in the socket without the necessity of a tang, and also by the use of special jigs, which the makers send to their customers, the drill press spindle may also be fitted up with one of their round steel keys. With this method employed in a shop they are able to use up all the old drills with broken tangs and prevent the good drills from having their tangs broken. They can also keep



their sockets from falling out of the drill press spindle.

The shells of these sockets are made from 1-16-in. to 1-8-in. thicker than the standard drill socket, so that the insertion of the hardened steel key does not weaken them. These keys are made from tempered drill rod varying in diameter ¼-in. to ⅜-in. They project one-third of their diameter into the open-

ing. These keys are all pressed in socket absolutely parallel with the angle of the bore and central with the tang slot. The shank end of the socket has a standard 90 degree V-groove, milled

its entire length, central with the tang. As these keys and grooves are all made standard by accurate jigs, they are all interchangeable with each other, allowing any combination of sockets.

As shown in the illustration it is only necessary to grind a flat on the old drills. The drift hole in socket is made extra long so that they can be easily knocked out. New drills can be ordered with the V-groove in shank from all makers at no additional cost. Drills in stock can be fixed up in a few minutes each in a milling machine. A bearing of whole length of keyway is given.

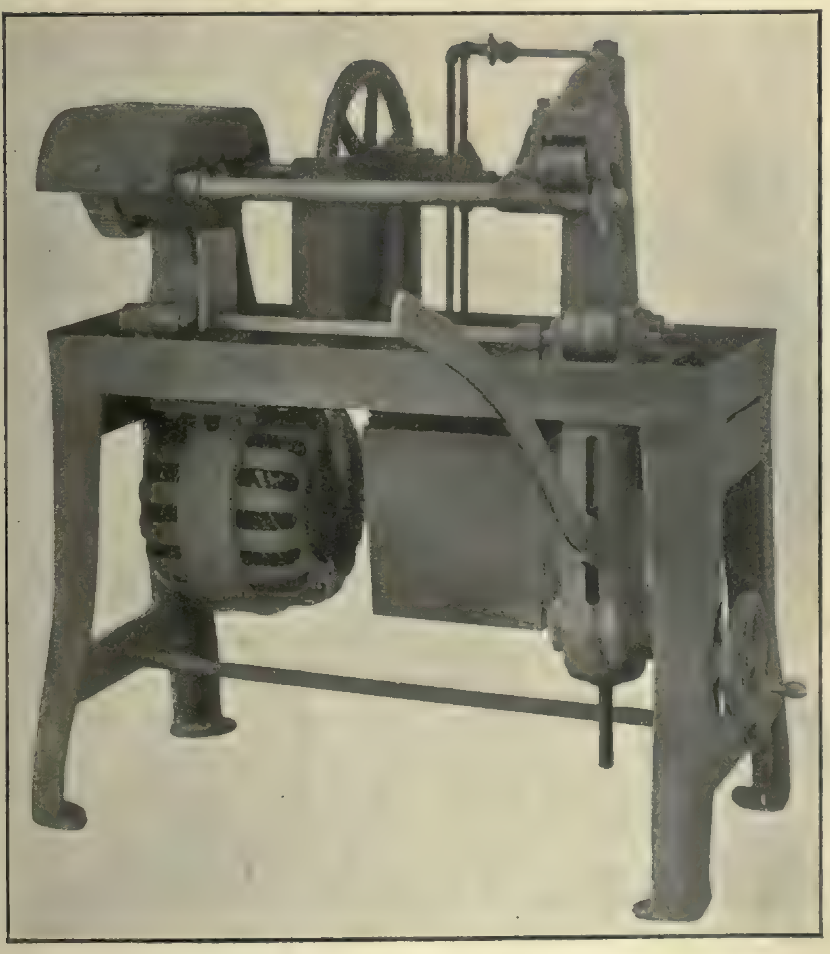
This development of drill socket is the invention of George R. Lang, and is manufactured by the G. R. Lang Co., Meadville, Pa.

MOTOR-DRIVEN PIPE OR TUBE CUTTER.

The machine is very compact in arrangement, and in place of the regular tight and loose pulleys is placed a large sprocket for the Morse silent chain drive. Two of the machines, as shown, were recently furnished to one of the largest railroad systems in the country for their locomotive boiler shop for cutting off boiler flues, safe ends, etc. The machine will cut off 4-in. boiler flue in about eight seconds.

Power from the motor is transmitted through the Morse silent chain and a series of gears to the cutter shaft. The flue to be cut rests on the two rollers under the cutting disc and the handwheel shown below adjusts the position of the rollers for different size pipe or flues. The cut is accomplished by depressing the lever which raises the rollers, bringing the flue against the cutter disc and severing it in a very short space of time, in fact, 1½-in. standard wrought iron pipe can be cut in about three seconds in this manner.

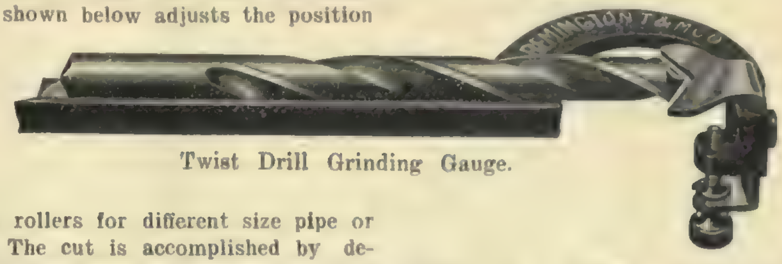
The machines are manufactured by the Fox Machine Co., Grand Rapids, Mich., 826-846 N. Front St., and equipped with 3 h.p. Westinghouse A.C. motor, for 440 volt circuit, 60 cycles, 3-phase.



Motor Driven Pipe and Tube Cutting Machine.

TWIST DRILL GRINDING GAUGE.

This is a simple, efficient and economical tool devised for testing the accuracy of twist drills. The sharpening and grinding of twist drills is important. That the cutting edges have a proper and uniform angle (59 degrees) with the longitudinal axis of the drill, having them of exactly equal length and the lips of the drill well and sufficiently backed off or cleared, are features generally recognized as essential to the perfect performance of a drill.



Twist Drill Grinding Gauge.

This gauge is made in three sizes by the Remington Tool & Machine Co., Boston, Mass. These have a capacity up to ½", 1" and 2" drills. It is simple in construction and adjusted by the thumb screw at the bottom, the gauge plate being raised or lowered to suit the size of drill.

PERSONAL.

H. W. Petrie, of H. W. Petrie, Ltd., Toronto, is in Vancouver on business.

E. I. Sifton has been appointed Engineer of London, Ont. Mr. Sifton will commence his duties at once.

F. A. Rundell, Chief Engineer, Whiting Foundry Equipment Company, Harvey, Ill., was recently in Montreal on business.

Anton Berg, president of the Berg Machinery Mfg. Co., Toronto, attended the fifth annual convention of the Sand Lime Brick Makers' Association in Washington, Dec. 16th and 17th.

Mr. J. R. Spragge, formerly road foreman, has been appointed district master mechanic on the Canadian Pacific Railway, with headquarters at West Toronto, Ont.

W. N. Ryerson, general superintendent of the Ontario Power Company, Niagara Falls, Ont., leaves on January 2nd, 1909, to take a position with the Great Northern Power Company, Duluth, Minn.

H. M. Lane who has been secretary of the Foundry Supply Association (connected with the American Foundrymen's Association) since its formation, recently tendered his resignation. Mr. Perkins, president of the Supply Association, has appointed C. E. Hoyt, of the Lewis Institute, Chicago, to complete the remainder of Mr. Lane's term. Mr. Hoyt is well known to the foundry supply trade as he has been secretary of the Chicago Foundry Foremen's Association for several years and has conducted the exhibits of foundry equipment that have been held at the Lewis Institute for the past two years.

POWER GENERATION AND APPLICATION

For Manufacturers. Cost and Efficiency Articles Rather Than Technical.
Steam Power Plants ; Hydro Electric Development ; Producer Gas, Etc.

GOLDIE & McCULLOCH GAS ENGINE.

The Goldie & McCulloch Co., of Galt, has recently acquired the Canadian rights to the gas engine patents of Mr. L. F. Burger, of Beloit, Wis., and has designed a type of engine embodying the essential features of these patents.

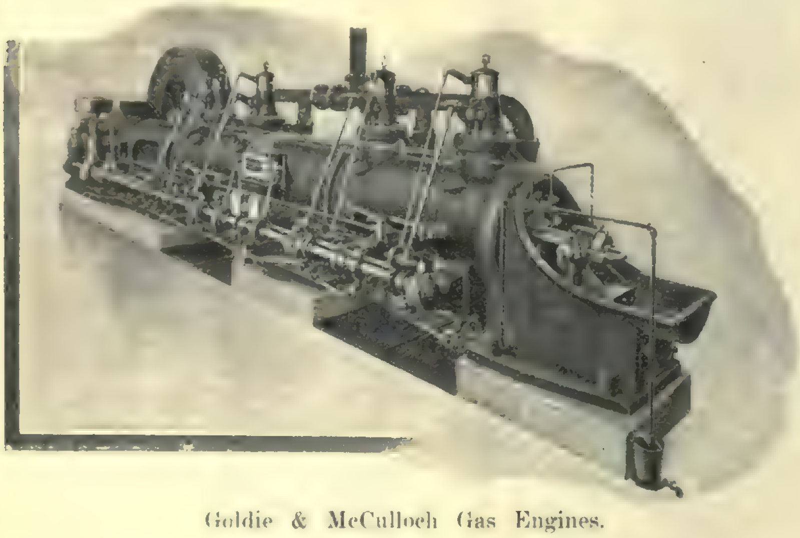
As will be seen from the illustration, this is a two-cylinder tandem double-acting engine—a type now generally adopted for high power engines, as it has the advantage of obtaining power from four cylinder ends without any increase in the size of frame, shaft or pins, and at the same time gives two impulses every revolution.

Valve Gear.

One of the most important features of the engine is the method of admitting the gas and governing the quantity. The governing is done by admitting suitable quantities of a constant mixture. This mixture is admitted through an auxiliary valve whose time of opening is controlled by the governor. The valve is placed directly over the main inlet valve, which opens slightly before the piston reaches the end of its stroke and admits free air to the cylinder producing a scavenging effect. The auxiliary inlet valve is afterwards opened where determined by the governor and closes at the end of the stroke. Variable quantity with constant compression is thereby obtained. The governor used is the celebrated "Rites Inertia Governor," which is adapted to taking care of sudden changes of load with a minimum change in speed. The main inlet and exhaust valves are of the mushroom type, with removable seats in water-cooled cages.

The main valves are operated from a cam shaft fitted with cams engaging with rollers on the ends of the valve rod levers. These cams and rollers are designed to give accurate timing to the valves and have large wearing surfaces. The auxiliary valves are operated from a supplementary cam shaft running parallel to the main cam shaft and connected to it and the governor through a "floating" gear arrangement.

The pistons and rods are water-cooled and are supported by the main cross-head, and also intermediate and tail cross-heads, thus keeping the weight of the pistons off the bottom of the cylinders and giving the packing and lubrication every chance to be effective. The lubrication of the pistons is effected by a positive feed oil pump, which is so arranged that the drop of oil can be delivered to the interior of the cylinder at exactly the right moment. The piston rod packing is metallic of a design that has proved its worth on some of the largest engines built in America, and is extremely simple, and, if properly installed and cared for, should last indefinitely.



Goldie & McCulloch Gas Engines.

Cylinders and Frame.

The cylinders are water jacketed, the jacket being provided with a large number of handholes which give easy access for cleaning out should the circulating water be of such a nature as to leave a deposit.

The frame connecting piece between the cylinders and the tail cross-head support are heavy castings with the metal properly distributed to carry the strains. The peculiar design of the cylinder connecting casting with its large opening and removable strut gives a convenient access to the intermediate cross-head and cylinder covers. The frame is provided with a cross-head of large diameter which enables the front cylinder cover and piston to be removed without disturbing the crank shaft. The crank shaft is supported by a main bearing on each side of the crank pin, thus distributing the strains evenly about the centre line of the engine and providing enough bearing surface to keep the unit pressure within safe limits for continuous service. The main bearings are provided with wedge adjustment.

The crank shaft is made from a solid steel forging and is liberal in its dimensions and besides the two main bearings is provided with a large adjustable self-oiling outer bearing on the fly-wheel side. The crank carries counter-weights of sufficient weight to properly balance the engine.

The starting device is extremely simple and automatically admits compressed air to the two inner cylinder ends so that these can be used to start the engine. When well started gas can be admitted to the two outer ends and got under working condition when the air can be shut off and the other two ends started firing.

The igniter mechanism is of the make and break type, and the timing of the spark is adjustable by hand when the engine is running. The engine is provided with two magnetos for supplying the current when the engine is up to speed and a double set of batteries and spark coils for starting.

The water circulation is arranged so that each part can be given just the amount of water required. Discharge funnels are provided on all outlets so that the operator can feel the temperature of the discharge water.

The Goldie & McCulloch Co., Limited, are manufacturing producers to furnish with their gas engines which are to run on producer gas. These producers are built under Burger patents.

A HANDY TUBE CUTTER.

By G. Campbell.

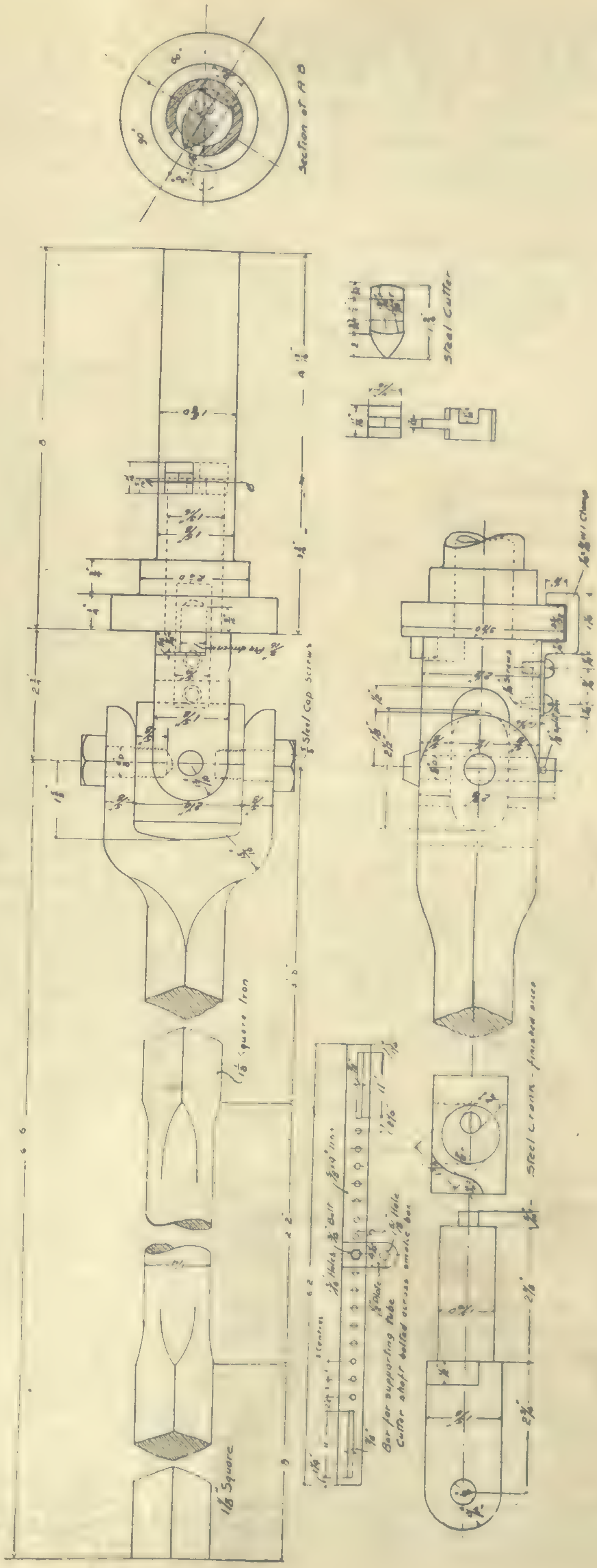
The tubes of a locomotive boiler become covered with scale, overheated and then they finally blister. These blistered tubes must be replaced at once if the locomotive is to be retained in service. In the G.T.R. at Stratford, Montreal and Toronto, a handy device is used for cutting out the tubes.

The accompanying sketch illustrates this tool, giving dimensions of the various parts. The steel cutter is seven-sixteenths inches from the shoulder, and the cutting point is one-eighth inch back from the centre. The cutting edge is 7-32 inch face and 1/8 inch at back, thus giving a clearance. The slot is 11-32 inch deep, and in this the small eccentric crank pin works. Reversing the tool draws the cutter into the crank or mandrel and the tool may then be removed from the flue. The travel of the eccentric is 1/2 inch, the crank pin being 1/4 inch from the centre. The pin is slightly longer than the depth of the slot in the cutter, so that the pin reaches to the back of the slot.

The steel crank is 2 7/8 inches long, and is 1 3-16 inches in diameter. The tube rests against the smaller collar. The centre of the blade is 1 11-16 inches from the collar cutting off 1 5/8 inches of the tube. The corner on the shoulder of the mandril is cut out as shown in the sketch, and a pin working on this curve throws the cutter into working position or the reverse. This pin on the large collar stands best when made of wrought iron and case-hardened.

A small clamp made of machinery steel and case-hardened holds these two parts together. The handle is connected to the tool by means of a toggle joint. At the G.T.R. in Toronto the handle is arranged for extension. In place of the square iron handle running all the way, a 1 3/4 tube has been forged on at the toggle joint. This tube is 2 feet 2 inches long and is squared at the outer end to receive a 1 inch square iron. The awkwardness of a long handle is thus removed as the iron rod can be run in or out of the tube to the required length. A collar is welded over the outer square end of the tube to insure strength.

The bar for supporting the tube cutter is bolted across the smoke box. The holes are drilled with 3 inch centres, but usually the rest plate is only shifted three or four times, cutting the tubes from a boiler as the toggle joint allows the tool to be used in any position. Adjustments on this bar allow it to be fitted to a large or small smoke box. The tool is worked by a ratchet wrench, and a few turns cut the tube from the boiler.



CANADIAN MACHINERY AND MANUFACTURING NEWS

A monthly newspaper devoted to machinery and manufacturing interests mechanical and electrical trades, the foundry, technical progress, construction and improvement, and to all users of power developed from steam, gas, electricity, compressed air and water in Canada.

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Subscribers who are not receiving their paper regularly will confer a favor on us by letting us know. We should be notified at once of any change in address, giving both old and new.

TRADE SUGGESTIONS.

Several firms in Canada are now endeavoring to find a market in Great Britain for various kinds of machinery. Catalogues have been sent to the Department of Trade and Commerce, together with requests for information regarding probable openings for trade. While it is not possible to obtain particulars of the multifarious types of machinery imported by midland firms, every effort is made to acquire such information as will enable the department to decide whether specific Canadian machinery is salable or not. The most commendable course is for Canadian firms to send a representative to this district to conduct their own investigations, as they would possess the necessary technical knowledge, without which it is exceedingly difficult, if not impossible, to interest probable buyers. Letters of introduction could be taken from the office of the Department of Trade and Commerce, by which means there would be no difficulty in obtaining a sympathetic consideration of any proposition Canadians may have to make. In the initial stages correspondence is unsatisfactory and seldom productive.

The Department of Trade and Commerce desires to seek the co-operation and assistance of Canadian exporters and manufacturers, with a view to the further extension of Canadian trade abroad. The Deputy Minister of Trade and Commerce invites those interested to give the Department the benefit of their views, with the hope that suggestions may be offered which will not only add to the usefulness of the Department, but will tend to promote Canadian trade

This Department requests that suggestions may be received to the following questions, after having been given due consideration: ,

(a) What would you advise should be done to increase the export trade of Canada?

(b) What improvement or change do you think desirable in the compilation of the trade statistics published by this Department?

(c) Can you suggest any improvement in the collection and publication of commercial information received from the Trade Commissioners?

As far as possible the suggestions should be accompanied by statements showing the reasons therefor. Should there be any general information which it may be thought desirable to communicate to the Department and which is not covered by the above questions, the information will be welcome.

WHY NOT A TECHNICAL PUBLICITY ASSOCIATION IN CANADA.

In New York there exists an association well known among publishers of trade papers, engineering and technical magazines with a membership consisting of those who are actually filling the position of advertising manager in concerns engaged in manufacturing machinery or in concerns who are allied with the machinery industry.

Probably one of the association's most important accomplishments is the securing of statements and information pertaining to advertising mediums. The circulation committee keeps records relating to circulation and statistics of various papers, obtaining new or revised information on request of members, who hold same in strict confidence.

There are no axes to grind in this association. Topics under discussion at meetings are usually laid bare and studied from every view point. The friendly interchange of ideas, the real experiences, with co-operation from interested friends have made the association very edifying and largely recognized among the advertising fraternity throughout the entire country and abroad.

With such an association in Canada there would be more publicity given to new machinery. The advertising department in most United States companies is well organized and publicity is given to every new machine placed on the market, the technical papers being given full information in regard to them.

In Canada technical papers come across new machines accidentally. The Canadian advertiser has not been educated in making them known, and the establishing of such an association would do much towards bringing out methods of obtaining publicity and show a manufacturer how to make best use of facilities at his command. People do not know about some of the machinery being built in Canada and making them public would interest the reader, give the manufacturer publicity and do justice to our country.

One good point about United States and Canadian publications is the space given to new machinery being placed on the market. In the Bulletin of the association for November, giving the proceedings of the meetings and a list of the members, is printed a speech on Foreign Publications by President C. S. Redfield, of the Technical Publicity Association, in which he states that there were a poor quality of trade papers in Europe giving as a reason the little demand.

There is a demand for good trade papers in Canada and the United States. The establishment of a technical Publicity Association in Canada along similar lines to the above organization would be of great benefit to both advertising and sales departments connected with manufacturing and supply houses.

Qualities by Which Any Man May Climb to the Top

Rungs in the Ladder of Success—High Up There are Numerous Vacant Places Awaiting Occupants — The Present Holds Great Opportunities.

By THE EDITOR

Canada has awakened. All parts of the Dominion are teeming with business and the joys of living. Every man, young or middle-aged, should be alive to the boundless opportunities offering themselves. Illimitable resources are being discovered and developed. Never in the history of this country has there been such a call for young men, ardent for work and with progressive ideals, to take their place in the growth of the nation. Everywhere the smoking chimneys and large factories speak of a world of industry where there are numerous opportunities awaiting the man who will avail himself of them, and has the courage and ability to undertake the work.

A ladder leads upward. Are you preparing yourself for advancement? Do you realize that before you are chances that have been denied your parents who surmounted many difficulties that have since been eliminated. Possibly the success of the statesman and the millionaire may not be yours, but real, genuine satisfying success awaits you.

With the beginning of the New Year, let us suggest some resolutions that will help you on the road to success which comes only with work.

The Nobility of Labor.

When the president of a railroad wishes his son to learn railroading, where does he place him? In the office? No man ever learned a business in the office. The way to get along is to go to work with the hands. It is in the shop where things worth while are learned and when you know how to make your hands support your head you can learn to make your head support your hands.

The mechanic is the backbone of the nation. He is the great producer who is daily adding to the wealth of the world. He it is, who makes the wheels of industry and commerce revolve. The mechanic may hold his head high and look the whole world in the face for he is an important and indispensable factor in the commonwealth. He wears smock and overalls but the sinewy hands and prominent muscles are a tower of strength. The writer knows the call of the seven o'clock whistle, the clink of the time check, the dinner pail, the smock and overalls and the line-up on pay day and is glad of it. One resolution that should be included by every mechanic at the present time is the one suggested in the morning prayer of Robert Louis Stevenson:

"The day returns and brings us the petty rounds of irritating concerns and duties.
Help us to play the man; help us to perform them with laughter and kind faces; let cheerfulness abound with industry
Give us to go blithely on our businesss all this day; bring us to our resting beds weary and content and undishonored, and grant us in the end the gift of sleep."

We extend to our readers and advertisers best wishes for a happy and prosperous New Year.

Definite Aim.

"Not failure, but low aim, is crime." Have a definite high aim. No one has even yet climbed higher than his ideal and no one ever shall. Be ambitious. Keep the top rung of the ladder in view.

"Not enjoyment, and not sorrow,
Is our destined end or way;
But to act, that each to-morrow
Finds us farther than to-day."

Man with no ideal beyond the daily round is like a ship without a compass. He is tossed about on the sea of life with no definite purpose in view, and he accomplishes nothing. The men who have given the world something had a purpose in view. James Watt's double-acting steam engine was not discovered by chance. He had something in view and worked faithfully until he accomplished it. The man with a purpose will climb the ladder while his companion gropes around the foot of the ladder seeing no farther ahead than his daily work.

There are several qualities which point towards the top rung of the ladder and by which a man may ascend. Let us suggest some of these rungs which will secure advancement.

Confidence.

Be confident. Don't overestimate your ability; don't underestimate it. Believe in yourself. Have something definite to do, and do it. That's all there is to success in life. Too many young men want success before they have earned it. They become discouraged before they have tried.

Determination.

Let no obstacle stop the accomplishment of your purpose. Christopher Columbus discovered America when his sailors laughed at him. The Bell telephone system covers Canada from Halifax to Vancouver, yet at first the inventor could not even sell stock in his company at any price. Wellington, Frobisher, Drake and Nelson succeeded because they were determined. Once the heavy iron jaw was set, nothing could change their purpose. Success comes to the determined man.

Enthusiasm.

"The work that we love, we rise betimes
And go to with delight."

Learn to love your work. Be enthusiastic. Enthusiasm is a quality that must be cultivated. It is one of the least common. Be not afraid of being considered odd. The man who occupies the premier's chair and undertakes the great public works of our country, and the men who are the captains of industry are enthusiastic men. The progressive enthusiastic man must be recognized.

Perseverance and Patience.

Patience is the hardest to endure. We are not content to work up the ladder one rung at a time. We want to reach it in a flying machine. We must earn our advancement. It is discouraging sometimes, but where the spirit of stick-

to-itiveness manifests itself, a man must go forward. James Watt's improvements in the steam engine were not made in a day. Wireless telegraphy was the result of years of labor. The locomotive had to be developed and perfected. George Stevenson and his son, Robert, worked faithfully on the improvement of the locomotive for years before success crowned their efforts.

Others may do much to improve conditions, but we must each do our own share, and when we seem to be accomplishing little, when courage is at low ebb, think of the men who toiled fifteen, sixteen, seventeen and eighteen hours a day against the greatest skepticism, and their achievements. Be optimistic and persevere. The patient, plodding application will exalt your position. The tale of the tortoise and the hare is familiar. Let this be your motto. "To strive, to seek, to find, and not to yield.

Pluck and Industry.

Success comes only with work. Andrew Carnegie's motto is to do your duty and a little more, and he has tried to follow it.

Success is obtained, not by never making mistakes, but in never making the same mistake twice. The man who never made a mistake never accomplished very much. Work honestly. Work intelligently. Find your talent and then work with enthusiasm and determination. Success was never obtained by wearing the dial off the clock.

The most important step toward success is to know your work, and knowing it, to do it intelligently and conscientiously, remembering that—

"Pluck wins. It always wins, tho' days be slow,
And nights be dark 'twixt days that come and go,
Still pluck will win. Its average is sure,
He gains the prize who can the most endure,
Who faces issues—he who never shirks,
Who waits and watches, and who always WORKS.

The Top Rung.

We have a prophetic vision of the top rung. As rung by rung the ladder is ascended, the horizon broadens out and the narrow, selfish opinions disappear. One never forgets the steps by which he ascended, ambition, a definite high aim, and confidence in one's self are among the first, and patience, honesty, perseverance, optimism, determination and enthusiasm are other rungs in the construction of the ladder of success. Forming the sides and supporting it is good, honest, faithful work.

CANADIAN CLAY PRODUCTS MANUFACTURERS' ASSN.

The annual convention of the C.C.P. M.A. will be held in Brantford, Ont, Tuesday, Wednesday and Thursday, January 12, 13 and 14, 1909.

ENGINEERS' CLUB, TORONTO.

The annual meeting of the Engineers' Club was held on December 10th. The election of officers resulted as follows: President, A. B. Barry; first vice-president, A. M. Canniff; second vice-president, R. G. Black. The directors, who are also chairmen of the committees, rooms, library and papers, are R. A. Baldwin and Stanislas Gagne.

At this meeting C. R. Young read a paper on Artistic Bridges for Populous Districts.

The annual dinner was held at McConkey's on Dec. 17. Mr. Randolph, of Ch cago, was the speaker of the evening and gave an interesting account of the Panama canal.

CANADIAN RAILWAY CLUB MONTREAL.

The Canadian Railway Club held a well attended meeting in the Windsor Hotel, on Tuesday evening, December 1st. A paper on "Steel Rails in Canada" was read by Mr. F. P. Gutelius, General Superintendent Lake Superior Division Canadian Pacific Railway.

One of the points brought out was the difficulties encountered by the manufacturers in trying to suit the severe climatic conditions prevalent in Canada. In view of the recent discussions among railway men regarding broken rails and other rail causes of accidents on Canadian railways, the paper was received with much interest by those present.

At the January meeting Prof. Bancroft will give a lecture on British Columbia.

CENTRAL RAILWAY AND ENGINEERING CLUB, TORONTO.

Before a well attended meeting of the Central Railway and Engineering Club Dec. 22, A. M. Wickens read a paper on "Electrification of Steam Railroads in Canada."

Mr. Wickens pointed out that the existing transportation facilities in Canada were taxed to their utmost. By their electrification, the carrying capacity of the tracks of these roads could be increased by thirty per cent. and the present congestion relieved. All trains could be run at a less cost by electricity than by steam. Electricity gave double the draw-bar pull per pound of coal than did the steam locomotive. Electric locomotives could go up a 2 per cent. grade at 10 miles an hour, while a steam locomotive was generally going two miles an hour at the end of a long grade. At ten miles an hour the electric locomotive could draw 20 per cent. more freight. The centre of gravity in electric motors was lower than with steam locomotives. This did away with the swinging motion when the train was travelling at a high speed and thus considerably lessened the strain on the roadbed.

At the close af the discussion the following officers were elected.

President, C. A. Jeffery, Master Mechanics, Consumers Gas Co.; 1st Vice-President, J. C. Garden, General Foreman, G.T.Ry., Toronto; 2nd Vice-President, Howard G. Fletcher, Rep. Garlock Packing Co., Toronto; Executive Committee, R. Patterson, Master Mechanic, G.T.Ry., Stratford; G. Black, Road Foreman G.T.Ry., Stratford; J. Bannon, Chief Engineer, City Hall, Toronto; G. Baldwin, Yardmaster, Canada Fdry., Co., Toronto; J. Markey, Master Mechanic, G.T.Ry., Toronto; H. Ellis, Machinist, Consumers Gas Co., Toronto; W. R. McCrea, Master Mechanic, Toronto Railway Co.; Auditors, F. G. Tushingham, Chief Engineer Tor. Ry. Co., Toronto; J. W. McLintock, Accountant, G.T.Ry., Toronto; W. A. Hare, Standard Engineering, Toronto; Reception Committee, A. J. Lewkowiez, Mechanical Engineer, Toronto; J. W. McLintock, Accountant G.T.Ry., Toronto; D. C. Hallowell, Air Brake Inspector, G.T.Ry., Toronto; E. Logan, Machinist, G.T.Ry., Toronto; J. Herriot, Asst-Gen. Strkpr., Canada Fdry. Co., Toronto; W. A. Hare, Standard Engineering, Toronto; R. Pearson, Machinist, Consumers Gas Co., Toronto; H. Cowan.

A.S.M.E. ANNUAL MEETING.

The twenty-ninth annual meeting of the American Society of Mechanical Engineers was held in the Engineering Soc'eties' building, 29 West Thirty-ninth Street, New York, December 1 to 4, inclusive.

The following are some of the papers presented at the meeting: Efficiency Tests of Milling Machines and Milling Cutters, by A. L. DeLeeuw; Metal Cutting Tools Without Clearance, by James Hartness; Interchangeable Involute Gear Tooth Systems, by Ralph E. Flanders; Training Workmen, by H. L. Gantt.

The discussions on the papers brought out many valuable points. About twenty papers altogether were read and discussed and it would be to the interest of Canadians to take an interest in this association.

The December issue contained the paper of A. L. DeLeeuw. In this issue is that of James Hartness, and in the February issue will be given the one on Interchangeable Involute Gear Tooth Systems.

FOUNDRY PRACTICE AND EQUIPMENT

Practical Articles for Canadian Foundrymen and Pattern Makers, and News of Foundrymen's and Allied Associations. Contributions Invited.

METAL MARKETS.

Despite the fact that we have entered upon the dull season of the year, trade in Canada has kept up well during the month. Naturally there has been a decided easing off in the large orders, as most of the big consuming firms covered themselves before the close of navigation. Even in these cases the stocks are not very large, and a strong consuming demand would soon find the concerns in the markets again. The smaller buyers have been practically making the markets lately, and from the regularity of the orders it is evident that a fair amount of metal is being put upon the market in the finished shape, as most buyers will not purchase until they receive their trade order first. Imported pig is likely to be stiff in price later on, as many users apparently did not cover themselves properly before the end of the open season. There has been such a run on store iron that before long shipments will have to be made from the Old Country with the additional winter freightage to pay.

Canadian prices have been somewhat affected by the change in the primary markets, although the good, steady trade done tended to keep the markets stiff. Tin has been a steady seller all the way through, but the weakening in the primary markets forced prices down, and small jobbing lots have been ranging around 33c. Copper has ruled at about the same prices as in November, the changes in the primary markets not being drastic enough to depress quotations here much. Figures are now about 15¼c to 15½c for jobbing lots. Business has been very steady, with inquiries good. Heavier trade may come, though at the commencement of the year. Canadian furnaces have been showing considerable activity, the tonnage changing hands, it is reported, being greater than at any time during the past two or three months. Several large lots of 500 tons and upwards have been sold at prices which show an advance of 50c to $1 per ton on the low prices of August and September. In fact, some small lots have realized fully $2 more on the lowest figures. There is no doubt that the improved conditions in the States have strengthened the home markets, helped by the good demand and the store prices for imported pig. Owing to firmness at London and St. Louis, spelter prices were advanced, and quotations have been ranging around $5.50. Very fair business has been done. Lead has not changed from our last quotation of $3.80.

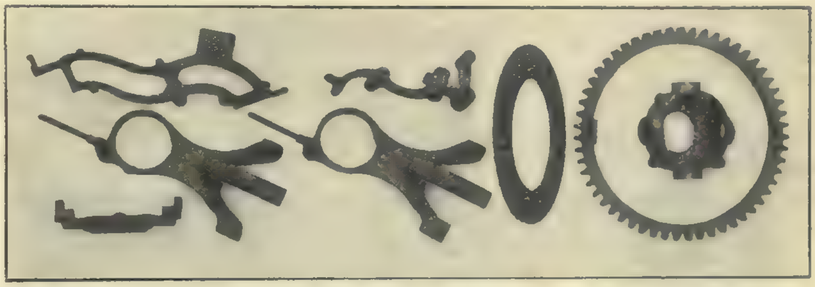
PRESSURE DIE CASTING.

The Lumen Bearing Co., corner Weston road and C.P.R. tracks, West Toronto, have installed some interesting machinery for the manufacture of pressure die castings.

Their plant in West Toronto is well equipped for the manufacture of lumen bearings, bronze and brass work. They have handled brass castings of nearly 3,000 lbs. amd molded manganese bronze weighing 2,200 lbs. In one mold the cope contained 5,000 pounds of sand. Over 4,200 pounds brass and bronze are poured at a heat and three heats are run per day. Some furnaces run five heats when aluminum is run between heats of brass. They have also a capacity of 2,500 lbs. babbit per day.

It is hardly necessary to point out what a valuable improvement this method of making castings will be to many who use small parts which require accurate machining and on which the expense of this work is frequently very high, this expense is saved and the manufacturer has the advantage of getting parts which are finished ready for assembling when they come from the foundry.

Such manufacturers as those who make phonographs, typewriters, prepayment gas meters, cream separator castings, adding machines, prepayment weighing and other machines of similar nature have found this method of making their parts of great value. Where threading is necessary it may be cut afterwards, but perfect gears and threads are made by the pressure die casting machine. The strength of the metal varies with the alloy specified, some mixtures giving castings stronger than malleable iron.



Samples of Pressure Die Castings.

The new die-casting department is interesting and sample castings made by this process are here shown. An ingenious patented machine is used for the work. This process is of special use where perfect yet intricate castings are required, these in varied shapes and sizes being shown in the illustration.

The castings are made accurate to .001 of an inch, and where holes at varying angles to one another are required those also are located accurately in the casting. If it is desired to have a thread cast within one or more of these holes, or to have an outside thread on the casting, these can also be produced on the pressure die casting machine. Castings weighing from one ounce to two pounds each are made and when ready to ship they present a finished appearance, sharpness of outline, smoothness of skin and accuracy that is impossible to arrive at by any but the most expensive automatic machines.

It will be apparent from the above description that where anyone has occasion to use a large quantity, say one thousand castings of a similar kind, upon which the machining cost is excessive and which weigh within the capacity of the pressure die mold machine, the system mentioned will be of great value.

LARGE CASTINGS.

The largest casting ever made in Ingersoll was poured successfully recently at the foundry of the Reid Foundry & Machine Co., Ltd. The order was secured by Mr. Reid from the Canadian General Electric Co., Ltd., Toronto.

The casting is 9 feet 7½ inches in diameter by 16 inches wide and 8 inches deep at the rib, and weighs 3,600 pounds.

Manufacture of Standard Railway Car Wheels

Modern Equipment at the Works of the Canada Car Co., Montreal—Whiting Instalation Includes Cupolas, Cupola Charging Machines, Tracks, Etc.

The stresses and strains that the car wheels of to-day have to undergo are very severe, owing to the increased rate of locomotion and the increase in the size and capacity of the cars themselves. It is only natural, therefore, that the making of the wheels should be most carefully scrutinized and the product thoroughly tested before being put into use.

The following is a brief description of the evolution of a car wheel in the shops of the Canada Car Company, Montreal. These shops have been equipped by the Whiting Foundry Equipment Co., Harvey, Ill.

Fig. 1—General View of Wheel Foundry Floor.

In the charging room are the scales, upon which the various ingredients of the charge are proportioned by weight. These scales have nine beams, each one set to the corresponding weight of the different metals to be employed in the mixture. For instance, No. 1 beam shows tare of the car; No. 2 shows weight of pig iron; No. 3, the weight of cast scrap, and so on, so that the weighing is greatly facilitated. From there the cars are run into the cupola room and hoisted to the level of the charging floor.

Fig. 2—Wheel Pits and Pitting Crane.

In running a day's heat there is a test piece, 6in. by 1½ in. by 2 in., taken every ten wheels' run, and these test pieces are examined for the presence of silicon, manganese, phosphorus and sulphur, The allowable amount of each of these being: Silicon, 0.65 to 0.70 per cent.; manganese, 0.45 to 0.52; phosphorus under 0.3, and sulphur under 0.015 per cent. Test pieces are also run, one from the first part of the heat, one from every third tap, and one from the last tap. These are 24 in. by 1¼ in. by 1¼ in., and are tested for breaking strength. The distance between supports is 24 ins., and the breaking load applied at the centre should be 3,300 to 4,500 pounds.

Pouring.

For the wheel department there are two cupolas, each having a capacity of 22 tons hourly. These cupolas supply stationary ladles, which are mechanically turned on their trunions by an operator situated on a platform commanding a view of the whole shop. This operator also controls the smaller ladles that carry the molten iron to the molds. These are placed on trucks that run on rails across the ends of the different lines of molds. The cars are hauled back and forth by means of a cable and the cars are spaced so that when their ladles have been filled and they are moved into position, there is a ladle at the end of each line of wheel molds, directly under a crane that runs the entire length of the molds. These cranes are operated from the ground by wires running the length of the shop just clear of a man's head, so that a man at any mold can operate the crane from where he stands. There are two men to each of these smaller ladles which hold just enough to pour one wheel.

Fig. 3—Drop Test Machine

There are ten wheels poured from each tap, and these are allowed to remain in

the molds from eighteen to twenty-two minutes. Then the wheels are taken to the annealing pits, (Fig. 2), where they are left for six days. From there they go to the cleaning room floor, where one day is allowed for them to completely cool. They are cleaned by wire brushes or sand blast and all cores removed, etc.

Mating, Testing, Etc.

After being thoroughly cleaned each wheel is "taped" or mated, and very carefully examined for any surface defects. The normal 33-inch wheel is 103.67 inches in circumference at the tread and the size of the chill is such that the depth of the chilled metal will be about ⅝-in. deep when the wheel is of normal diameter. Number 3 tape or class is the normal size and it is obvious that the deeper the chill the smaller the circumference or tape, on account of greater contraction of the tread. The M.C.B. specifications allow a deflection of 3-32-inch either way from the normal circumference of 103.67 inches.

Those wheels found with surface defects or too small or too large taping are rejected and remelted. One wheel is selected from each of the different taped sizes representing the day's cast, and taken to the test drop (Fig. 3) to be tested for physical defects. The wheel is suspended on three points in a central position under the drop. This drop weighs 200 pounds, hoisted by compressed air but falling free. A 600-pound wheel must stand 12 blows of this drop falling from a distance of 12 feet, without breaking to destruction. After each wheel is broken the condition of the metal in the break and the depth of chill noted. If the wheel shows too much chill, that is, over 1 inch deep, it is rejected regardless of breaking strength. If the chill is too small, under ⅜-in. deep, it is rejected, and the wheels from this day's cast of this "tape" are all rejected.

Some railways do not like the drop test, but prefer the thermo test. In the latter a wheel is set flange down and perfectly level. Then a channel way 1½ in. wide by 4 in. deep is formed around the circumference and this is poured full of molten metal. The wheel should stand this test for two minutes without showing any breaks or cracks, that is, the web or plate must be strong enough to counteract the rapid expansion of the tread caused by contact with the hot metal.

Another test is a drop test of 50 lbs. falling 12 feet, and striking on the single plate of the wheel between the tread and the double plate.

The wheels are then taken to the machine shop, bored out and pressed on to the axles at a pressure of about 40 to 60 tons, the M.C.B. specifications state "not less than 35 and not more than 60 tons."

The life of a car wheel is figured in mileage and should be about 70,000 miles. Frequently the wheels stand 180, 190 and as high as 200 blows of the 200-pound drop before breaking.

Foundry Machinery—Molding Machines, Flasks, Mills, Etc.

Extract of Report of Committee of Stove Founders' National Defence Association on Foundry Machinery—Descriptions are Here Given of Molding Machines and Patterns, with Costs and Conclusions Arrived At.

The committee pursued its investigations by correspondence and by personal visits to the following places ; Toronto, Ont.; Philadelphia, Cleveland, Detroit, Dowagiac, Chicago, Freeport, St. Louis, Newark, Syracuse and Utica. In and about these places many foundries were visited and many men interviewed, including a number of molding machine manufacturers.

The conditions most favorable to greatest success with molding machinery are : Patterns of a size and shape that can be successfully made on the machines now on the market. long runs on the same patterns, co-operation of operatives in securing maximum output from the machines.

Squeezers.

For such work as is ordinarily made on the bench a choice of widest variety is offered running from the simple squeezer, costing about $40, to the complicated automatic machines, costing upwards of $1,500.

In squeezers, the inherent time saving operation is the pressing of the mold. The maximum output may be gained by the use of a double-faced match plate and pneumatic rapper. This outfit, simple and inexpensive as it is, may effect a saving over bench work of one-fifth to one-third. We are also advised by the manufacturers that stripper jobs may be made on squeezers and the change from matchplate to stripper effected in two minutes. Double face aluminum matchplates made of two parts aluminum to one part zinc ought not to average over $10 in cost.

The squeezer with duplex matchplate is an elaboration of the simple squeezer and includes a number of special features. The distinctive feature and the one which mainly accounts for the large output that may be secured from this machine is the placing side by side of both cope and drag, which are both filled with sand and tucked while the molder has his shovel in hand and before he lays it down. Examples of large outputs are 250, 10x19-in. molds in less than seven hours molding time and in the same time 220 molds of 8-in. covers, two in a mold. It is claimed that the attachment of a pneumatic rapper increases the capacity of this machine and it may be so equipped. The examples of a day's work named above, however, were produced without the pneumatic rapper. The cost of match plates for one set of patterns is from $22 to $60. $22 to $30 is the usual cost when self-made and $50 is the usual charge made by the manufacturer of the machine. In places where these machines are in use we found it regarded as good practice to match plate for this machine any patterns of which 1,000 or more molds per year were to be made.

We found some application of small work in the stripping plate type of machine, but in most cases it seemed to the committee that a more favorable result could be secured with small work in applying it to the squeezer type just named. The stripping plate machine finds a more logical and profitable application for larger work, with barrel flasks where hand ramming is used.

We observed very few of these machines in use under what seemed to us the most favorable conditions and hence are unable to state from our own observation what may be expected of them. There appears no reason, however, why together, with the simple squeezer, this machine should not find a more extended introduction into stove shops. They have the advantage that the pattern rigging best adapted to the machines is likewise best adapted to the bench.

Automatic Machines.

The full automatic machine in perfect order is probably capable of producing molds at less cost than any other type

of machine. It has the advantage of being able to produce in a very short time a very large number of castings from one set of patterns. We had no opportunity of noting carefully the range of work of which such machines are capable, but it is not likely that this machine can be depended upon outside of the range of flat or shallow work. There is a wide field of usefulness for automatic machines and any lack of reliability or endurance of past machines will no doubt be largely overcome in the future development of this type.

The machine used in multiple molding is a power-ramming machine. This method has so far been applied only to heavy work of small area. Since the impress of both the cope and the drag pattern are rammed into the same half-flask at the same time, this forms a very quick method of molding. It has the advantage of requiring small floor space, since five complete molds and sometimes more, rest in the space of one. With an air hoist operating over the molding floor a bull ladle brought to the floor on a trolley is used to pour off and the molds shaken out by the hoist. It becomes easy in this manner to handle cheaply and easily a large amount of sand and iron. This method of molding, handling iron, flasks and sand, probably reduces molding costs lower than anything else that we saw.

We observed hand ramming stripping plate machines in use on work such as fire-pots, oven burners for gas ranges, boiler sections, etc. It seems to find its best application on the large work such as boiler sections. It also has its application on deeper work.

The hand ramming rock-over drop table machines seem to be adapted to any flat work, requiring barred flasks. We saw it used for making end shelves, gas stove tops, etc. This machine is also designed for making work of considerable depth. We found fire-pots being made, the cope on a rock-over drop table machine, the drag on a stripping plate machine.

The gravity molding machine is a patented machine and method and was under our observation only in demonstration. In other lines of work it is said to be giving good satisfaction and giving a large output. It is unique in being the one machine that gives promise of doing away with hand ramming on barred flasks.

Two match plate and hinge devices came under our observation, one being used in connection with iron flasks, the other being used in connection with the ordinary flask now in use in any foundry. The latter consists of a simple hinge which may be attached to any wooden flask and it is so constructed that the two parts of the flask with the match plate between them may be rammed up together, or in the case of large flasks the matchplate supported by a frame during the ramming of the first half, and first the cope rolled off on the hinge, then the match plate rolled off and the cope rolled back on again in the hinge and the flask thus closed.

Deep Work.

The power jar or jolt ramming type of machine is particularly designed for work in which the ramming is a large factor such as fire-pots, etc. It is likewise said to be successfully used for steam and hot water boiler sections.

One foot-power jolt ramming and pressing machine seems to be very well adapted to making deep work of small size in snap flasks. It is similar to the squeezer type with duplex match-plates and pattern drawing mechanism above mentioned. In addition to the pressing mechanism it has a foot-jarring mechanism for ramming which makes it possible to ram deep work successfully and does away with the necessity for tucking. We saw some oven door spring caps made on this machine that had been previously made on the floor. In the machine the use of gaggers which had been used on the floor was done away with and the output more than doubled.

This concludes a general review of the committee's observations concerning the different classes of molding machines and devices in use on stove plate work and the character of work which they are best designed to handle. It will be observed that the small work, such as can be made in snap flasks up to 400 square inches in area, offers the widest range of choice of apparatus and that the apparatus which may be used for making this class of work reduces the requirements for molding skill and the hand work performed by the molder to a minimum. On work of larger area the demands upon the skill of the molder are greatest and it would be reasonable to argue that the use of so simple a device as a hinge flask and matchplate would be an insufficient substitute for years of apprenticeship to the trade.

Long Runs on Same Patterns.

How many pieces must be made per year to make it pay to use the machine ?

In one shop where this question was asked in reference to the patterns of larger area made on hand ramming rock-over machines we were told that it would pay to put a pattern on the machine in the cheapest possible manner when only 200 or 300 castings were to be made. With larger quantities of 1,000 or upwards to make it pays to use the most perfect and expensive rig. With regard to the duplex match-plate squeezer type where a set of patterns costs from $22 up to $60, we learn from a number of users that it generally required the making of 800 to 1,000 molds to make it pay to rig up the patterns. By comparing patterns and prices of work you propose to rig for machine molding with similar patterns, and their molding prices when made by the method proposed, the reduction in molding price may be foretold, so that you may with sufficient accuracy forecast the total saving in molding cost in making the required number of castings. In this manner and after giving due consideration to other minor factors, the advisability of matchplating patterns may be definitely determined for each separate pattern, and the number required to make it pay. It may be added that when new patterns are being match-plated no follow boards are required and the cost of making them may be figured against the cost of the match plates.

The simplest type of hand molding press without pneumatic rapper may be purchased for about $40.

Other types of hand presses which have the roll-over feature and mechanical hand draft may be purchased for $200 to $300 each. The more elaborate power machines cost from $400 up.

The cost of patterns placed on the machines ready for use is from $10 to $60 each, according to the material used, size and shape of patterns, and style of pattern plates. Where stripping plate machines are used, this question is best answered for each pattern by the molding machine manufacturer.

The output of any machine will, of course, vary with the type of machine, size, weight and style of patterns and pattern rigging and the molding price, of course, will vary with the output. The reduction in molding cost will vary from 30 to 50 per cent. This is, of course, a general statement and wide variations will be found. We have noted cases in which the reduction from bench prices amounted to little more than 20 per cent., while in other cases the reduction was almost two-thirds of the floor or bench price. In foundries where equipment and methods are poor, well adapted machines and pattern equipment have the opportunity for realizing greater savings than in shops where the floor and bench equipment is first-class and the maximum output according to the methods now in use is already secured. The figures above named are meant to be comparative of the best results of both the old floor or bench methods and the new machine methods, i.e., they are meant to represent the labor saving ability inherent in the use of the various forms of molding machinery on the usual run of stove plate work.

(Continued in February Issue.)

INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News.

Foundry and Machine Shops.

The new factory of the Evans Co., at Sudbury, is nearing completion.

A $17,000 addition will be built to the Canadian Foundry Co. at Fort William.

An addition has been built to the P. L. Robertson Co.'s machine shop, Milton.

Louis H. Bacque, Montreal, has been appointed Canadian agent for the Baillot cupola.

The C.N.R. may build repair shops in the suburbs of Quebec. The shops would cost $200,000.

The R. Watts Machine Works, Ridgetown, is enlarging by the erection of a new molding shop.

The Madison Williams Foundry, Lindsay, has been filling many orders for mill plants, and a couple of water wheels.

The Garrie-Brook Mfg. Co., will build a foundry in Pembroke, to make all kinds of grey and malleable iron castings.

The Angus shops, Montreal, are turning out twenty freight cars a day. The construction of new locomotives has also been resumed.

About $900 damage was done by a fire which broke out in the D. J. Johnston & Co. brass foundry, Toronto. The building was damaged to the extent of $400 and the contents about $500.

The Expanded Metal Company, Toronto, have been awarded the general contract for a plant to be erected at Port Perry, Ont., for the Weber Gas Company, Janes Building, Toronto.

The Garrie-Brook Mfg. Co. will build a foundry at Pembroke for the making of all kinds of grey and malleable iron castings, and a patent crane run either by oil fuse or gasolene.

The C.N.R. has placed an order with the Rhodes, Curry Co., of Amherst, N.S., for one thousand box cars, which, with passenger equipment, will aggregate eleven hundred thousand dollars.

W. J. McLaughlin, Milford, Conn., a molder and employe of the Ontario Iron & Steel Co., Welland, was very seriously injured by a block falling from an overhead crane. His skull was fractured.

A. F. Johnson, Paris, Texas, has addressed a letter to officials of the Grand Trunk Pacific in Winnipeg, with reference to the establishment of a factory in western Canada for the production of shovel handles.

The Mac Machine Co., of Belleville, have received an offer to go to Orillia, but will remain in Belleville, providing that city grants exemption from taxation and free power for four months each year.

Boyd & Company, Huntingdon, Que., are erecting a foundry in connection with their machine shop there. This firm manufactures hay presses, threshing machines, etc., besides doing a general repair business.

Representatives of the American Car & Foundry Company, Buffalo, have been in Hamilton looking for a site on which to establish a Canadian branch. It is practically settled that the firm will commence operations there.

Howard & Cohen, stove manufacturers, Morrisburg, Ont., are moving their business to Valleyfield, Que. They are busy erecting new buildings in the latter place, and will commence manufacturing within a few weeks.

The Erie Evaporating Company, of Dunnville, Ont., will erect a $10,000 evaporator at Winger, Ont. The building will be two stories in height, of brick construction, with cement foundation, felt roof, natural gas heating.

Canadian Gas Power & Launches, whose Chatham plant was formerly the Defiance Iron Works, announce that they have decided to enter the field of general jobbing and repair work in both foundry and machine departments.

The report that the Otis-Fensom Elevator Co. were thinking of leaving Hamilton for Toronto is denied. The firm are, however, considering the erection in Toronto of a big iron foundry to make castings for other firms, as well as their own.

The Anchor Screw Co. have secured a plant at Toronto West, where they will manufacture patent screw-nails, etc. Machines for their manufacture are now being constructed. A Fairbanks-Morse 50 h.p. suction gas producer has been installed.

The Chatham-Electro Plating Works is a new concern which has just opened an office and started in business at Chatham. P. W. Burk and G. R. Speed are the men behind the concern, which does all kinds of gold, silver and nickel electro-plating.

The Lunenburg Foundry Company have completed a splendid gasolene engine. This is the first engine of its kind ever turned out of a county factory. The company are having patterns made for a 3 h.p. engine and will put out engines from 3 to 18 h.p.

The new premises for the Louden Machinery Company, Guelph, are almost ready for them to move in. The Aspinwall Machinery Company in their turn are apparently almost ready to move into the old drill shed at present occupied by the Louden Company.

The Henderson Roller Bearings has recently moved its plant from Niagara Falls to 169 Niagara Street, Toronto, where they have secured a factory of three floors of about 100 feet by 40 feet, and are now doing a very satisfactory and profitable business. Their machinery is largely automatic.

St. John, N.B., is likely to have a new industry. Stewart & Pazzant, two expert molders, at present employed with the Seaside Foundry Co., of Plymouth, Mass., are contemplating the opening of shops in this city for the manufacture of small steel castings. Both men formerly lived in St. John. It is understood they will open a foundry in the spring.

St. Clair Bros., Galt, Ont., are erecting new machine and blacksmith shops to give them better facilities for handling a larger line of work. The machine shop will be 50x100 feet, and the forge shop 30x30 feet, both constructed of concrete. New forging equipment will be added and they expect that their new premises will be ready about February, 1909.

The Marine & General Engineering Company, of Sydney, have moved into the plant at Kings Road, considerable machinery from the Coxheath Copper Mine. Some of the machinery of the sawmill there has also been transferred to the Engineering Company's plant, and a quantity of the mine apparatus will be stored at Coxheath until it is required.

The Vancouver Machinery Depot, Limited, have recently received one of the largest orders for logging engines ever given in B. C. This consists of two 13x14-inch Washington yarders, the largest in the province; two 12x12-inch compound geared Washington yarders, and four 10½x10½-inch compound geared Washington yarders; all to be delivered by the first of April.

H. C. Burchell, general manager of the Sydney Cement Company, who has just returned from a visit to Amherst, says that the industries in that town are all booming. The Rhodes Curry Company have sufficient orders on hand to keep the plant running for a year, and the prospects are bright for a busy season for the Robb Engineering Company and the Amherst Foundry Company.

The Vancouver branch of H. W. Petrie, Ltd., recently received and unloaded two cars of machinery, amounting in all to 30 tons. This company have also through their Vancouver office received an order for the entire equipment of the new planing mill and sash and door factory for J. D. McDonald, of North Vancouver. They are also supplying a new 24-inch planer to Andrews & Donaldson, carriage builders, of Nanaimo, and a new 10x10-inch Dutton 50 h.p. engine to the Port Hammond Lumber Company, of Port Hammond, B.C.

The Canada Zinc Works, at Nelson, where an experimental run has been going on for some time, started out recently on a regular reduction run, the initial run having proved entirely satisfactory. The successful starting of the new Zinc Reduction Works means a great deal for the mining industry in the Kootenay. The electrical process of treating ore, which contained 40 per cent. zinc, 10 per cent. lead and 12 oz. in silver, with 1-5 per cent. copper has proved a success. The process is the first of the kind in Canada turning out spelter, silver, lead, bouillon and copper matte.

The Rhodes-Curry Company, Amherst, have orders on hand for railway equipment totalling over one million dollars. They have just closed an order for one thousand box cars for the Canadian Northern Railway. This order will keep the works running to fullest capacity for some time. Recently the company's car-erecting shops, together with eighteen cars, were completely destroyed by fire, causing a loss of $160,000, and throwing one hundred men out of employment. These mechanics lost all their tools, the kits being valued at from $50 to $200 each. The company will rebuild the shops at once.

A. St. Johns and A. R. Crocker, both experienced machinists of St. Catharines, have opened up the foundry owned by Henry Sewrey. Since the Dyment foundry was burned in 1906, all endeavors of the different councils to arrive at some basis of conciliation with Simon Dyment, who owns the foundry, proved futile. He wanted a bonus from the town of $20,000, payable back in yearly instalments of $1,000. A by-law was twice submitted to the electors, and both times the majority fell short of the required one. The foundry, which was rebuilt soon after the fire, still remains with the windows boarded up.

W. J. Copp, a member of the old stove firm of Copp Brothers, Hamilton, died suddenly recently. He was well known throughout Canada, and before engaging in the stove business carried on a hardware and tinware business in Hamilton, in company with his brother Anthony. They also conducted a foundry business in Woodstock for a time. He had an interest in the stove manufacturing concern of W. J. Copp, Son & Company, of Fort William. The business is at present being carried on by his son, Harold Copp. Mr. Copp was at one time president of the Canadian Stove Manufacturers' Association.

Municipal Enterprises.

Ladysmith, B.C., will have a sewerage system to cost $50,000.

Toronto waterworks will, it is expected, yield a surplus this year of about $50,000.

The council of Revelstoke will spend $10,000 to complete the civic power and light plant.

The town of Hawkesbury, Ont., will spend $30,000 on a waterworks and sewage system.

The British Columbia Electric Railway have inaugurated an electric lighting service at Chilliwack.

A by-law to raise $15,000 for street improvements will be submitted to the ratepayers of Almonte.

It has been decided to submit a by-law in January next in Hamilton to raise $65,000 for sewer extensions and $300,000 for good roads.

Stratford ratepayers will vote on a by-law to take 1,000 horse-power from the Hydro-Electric Power Commission at $27.10 per horse power.

Peterboro ratepayers will vote on a by-law to expend $50,000 for the erection of a new bridge across the Otonabee river at Smith St.

As the contract between the Montreal Light, Heat & Power Co. has expired, Mayor Payette favors a municipal plant to supply Montreal's street lights.

Pembroke council may submit a by-law to the electors to either instal a new intake pipe at a cost of $30,000 or to have slow sand filtering at a cost of $90,000.

A by-law to raise $5,000 by debentures for he erection and equipment of public swimming baths in London will be submitted to the ratepayers on January 4.

The Canadian Electric and Water Power Co. have issued a writ against the town of Perth, Ont., for $3,000 for hydrant rental for 1905-6-7. The town will fight the action.

The sewage disposal plant of Toronto will be pushed ahead with all possible speed. A site has been decided upon and the general scheme for the tanks has been arranged.

A new water system is being installed by the G.T.P. in Prince Rupert, as the old mains were found to be too small. A reservoir of 50,000 gallons is being erected back of the town.

London ratepayers will vote on a scheme to increase the water supply of the city by 1,500,000 gallons daily by taking in springs and erecting a pumping station at a total outlay of $441,000.

Vernon, B.C., council have decided to spend $25,000 on the B. X. Creek water supply. Reports were received from John Galt, C.E., and Messrs. Meredith & Tracy, estimating the Long Lake scheme to cost $96,000.

Owing to the scarcity of water, Fort William has asked the Ontario Government to give the Kaministiquia Power Co., which has a concession at Kakabeka Falls, permission to conserve the waters of several streams running into the Kaministiquia river.

At the London municipal elections in January the ratepayers will probably vote on a by-law to raise $441,000 to carry out a scheme of the Water Commissioners for the increase of the water supply. The plan includes the taking in of the Kilworth supply at a cost of $125,000. It is proposed to erect a pumping station in the north end of the city.

In Victoria, B.C., neither of the tenders for the two pumps for the salt water high pressure system was quite in order, as both ignored the city specifications wholly or in part and substituted their own. The tenders were put in by R. P. Rithet & Co., who offered to supply the pumps for $20,590, and the Victoria Machinery Depot Company, for $18,180.

Pembroke ratepayers carried a by-law to ratify a contract with the Pembroke Electric Co. The corporation are now empowered to raise the sum of $10,000 for the purpose of instaling an electric pump, 200 horse-power motor and the necessary trip-valve for the stand-pipe. The contract with the Pembroke Electric Light Company covers a period of ten years.

To Verdun belongs the distinction of having the first municipal water filter plant on the Island of Montreal, and in a few weeks the new town will be supplied with filtered water for all purposes. Water is taken at a distance of 1,000 feet from the shore, in the main current, and runs by gravitation into a large steel well, from which it is pumped and filtered.

Under municipal ownership the charges for electric light in Orillia have been reduced as follows: For stores, from 28c to 18c per lamp a month; for houses, from 20c to 18c a month. This is for 24-hour power every day. Last year there was a profit of $10,000 after meeting all charges, which was applied to the reduction of taxes. Even with the reduced cost of light to consumers this year, it is expected that there will be the same surplus, as 1,000 new lights have been installed in the past three months. Under private ownership the cost of lighting was about 35c per lamp.

Railway Construction.

The C.N.R. has seven miles of track laid on its new line from Calgary to Saskatoon.

The Canadian Northern may be extended north from Macleod's pit to Brant, in Stonewall district.

An electric railway line is likely to be built from Calgary to Milverville, a distance of 28 miles.

An electric railway line is proposed between Woodstock, and Guelph, by way of Innerkip, Bright, Baden and Berlin.

The G.T.R. has recently placed an order with the Pressed Steel Car Co., of New York, for 1,000 steel hopper coal cars.

It is likely that construction will be started at an early date upon the projected Alberta Central Railway, from Red Deer, Alta., westerly to the Rocky Mountains, about 70 miles.

A radial railway is proposed from Tillsonburg to London, with branch lines to Port Boswell, Aylmer and other points, for a charter for which application will be made at next session of Parliament.

Application will be made at the next session of the B.C. Legislature for an act to incorporate a company to construct and operate a 40-mile steam or electric railroad from Corbin to the international boundary.

Mr. Wm. Mackenzie says that in the future not far distant he expects an electric railway to be constructed on the right of way of the Toronto & Niagara Power Company's transmission line, which line will connect Niagara Falls direct with Toronto.

Notice is given that the Canadian Pacific and Grand Trunk Pacific Railway Companies will apply at the coming session of Parliament for an act to ratify the agreement, dated the first of December, providing for joint terminal facilities at Fort William.

The Lindsay Construction Company have completed their contract with the Dominion Coal Co. for the construction of the branch railway from Grand Lake to Waterford, and the grading about collieries Nos. 10 and 12.

The Grand Trunk Pacific Railway has decided to at once erect ten station buildings at various points along the line where depots have not as yet been provided. Tenders for these buildings will be called for in the near future.

Alberta will create a new department of government—that of a Department of Railways, which will pursue a vigorous policy of railway extension for the purpose of developing the province. The province will build its own railways.

J. H. Tremblay, St. Boniface, Man., has been awarded the contract for the two large freight sheds to be erected near the Union Depot, Winnipeg, in the C.N.R. yards, for the joint use of the Grand Trunk Pacific and the Canadian Northern, at a contract price of $92,749.

The Canadian Western Railway Co. will make application at the next session of Parliament for articles of incorporation for the purpose of constructing, equipping, maintaining and operating a railway system in the western portion of Canada.

The Temiskaming and Northern Ontario Railway is now practically completed from North Bay to Lake Abitibi. A railway is now being sought to Gow Ganda Lake, and the suggestion has been made that the Canadian Northern should be extended between Sudbury and Gow Ganda Lake.

The Grand Trunk Railway is contemplating the instalation of a block system on the main line from Montreal to Sarnia, and also from Sarnia to Chicago. It is believed that the work will be started in the spring, and will cost about $1,350,000 for the 900 miles of track.

Tenders were recently opened by J. Oakley, chairman of street railway committee for the construction of the street railway car barn and machine shop for the City of Fort William. The buildings will be of brick and reinforced concrete, with steel roof trusses, and will cost $30,000.

The contract for the construction of new carshops, etc., for the Winnipeg terminals of the National Transcontinental Railway, has been awarded to Messrs. Thomas Kelly & Sons, of Winnipeg. The work, which calls for the expenditure of about $500,000, will be commenced at once.

The Canadian, Liverpool and Western Railway is seeking legislation to construct a railway from a point on the National Transcontinental Railway, near the St. Maurice River, in Quebec, to Lake St. John, and along the Saguenay to its mouth; also a line extending to Quebec and Montreal.

The Smith's Falls Board of Trade and Council have been in consultation with the C.P.R. officials in regard to the building of shops in Smith's Falls. Recently a roundhouse to hold 23 engines and a large machine shop were completed. It is now proposed to build shops at this divisional point, giving employment to several hundred men.

Application will be made to the Government for a charter for an electric belt line from this city to Morrisburg, westward to Brockville, through Darling to connect with the North Lanark steam railway from Ottawa to Darling now being constructed. The proposed line would cover 143 miles and the estimated cost would be $14,000 per mile, or $2,002,000 for the whole undertaking.

The National Transcontinental Railway Commission has signed the last contract to be let for the construction of the whole road from Moncton to Winnipeg. The last division turned over to the contractors is a stretch of 204 miles through the clay belt of New Ontario, beginning at a point ten miles west of Lake Abitibi and running westwards towards Lake Nepigon. The contract went to the lowest tenderers, Messrs. M. P. and W. H. Davis.

Good progress has been made by the Grand Trunk Pacific during the construction season, which is now closing. During the past summer track has been laid from Port Arthur to Superior Junction, 200 miles, and from Winnipeg to Battle River, 666 miles. Grading has also been done on the prairie section as far as Wolfe Creek, 129 miles west of Edmonton, and 910 miles west of Winnipeg. Soon the Clover Bar and Battle River bridges will be completed, and trains will then be able to haul steel for the Saskatoon to Edmonton part of the line. It is hoped that the whole stretch of track from Winnipeg to Edmonton will be opened for traffic early next summer. By next fall it is expected that the G.T.P. will have altogether some 1,200 miles in operation.

The Canadian Northern has bought the Duluth, Rainy River & Winnipeg road for $6,000,000, which gives Mackenzie & Mann complete direction of a line that will connect Duluth with Winnipeg. "The Canadian Northern," said Mr. Mann recently, "now controls the logging road formerly owned by the Virginia Lumber Company, which brings the road within seventy miles of Duluth. The Canadian Northern can enter that city at any time it seems advisable. The logging road extends to Fort Frances and is 93 miles long." Mr. Mann added, "The end of the current fiscal year will find us with about two hundred and fifty miles of new road. The Canadian Northern adds about three hundred miles to its system every year. It builds just so much road as can earn its fixed charges; this is the safety check to our extension."

Electrical Notes.

The Western Electric Company has opened an office in Fort William.

The Electric Light Co., Okotoks, Alta., are erecting a building and instaling machinery at a cost of $10,000.

The Dufferin Light & Power Company have completed building their transmission line from the Huxtable Roller Mill to Shelburne.

Archie L. Simmie, of London, is engaged in instaling a 500 horse-power engine in the plant of the McKinley-Darragh-Savage Mining Co., Cobalt.

A contract has been let by the British Columbia Electric Railway Company for the manufacture of 150,000 ties to be used in the construction of the Cloverdale-Chilliwack section between Vancouver and Cloverdale.

The Hydro-Electric Power Commission's agreement with Toronto promises to deliver power to Toronto by December 19, 1909, and R. L. Atkin, engineer in charge of the city's distribution plant, says the transmission line should be completed by that time.

A deputation from Belleville recently waited upon the Ontario Government in regard to improving the Moira river's natural reservoirs in order to provide electric power for Belleville, Tweed, Madoc and other towns. Concrete dams at various lakes may be built, at a cost of $35,000, to preserve the natural flow.

The electric locomotive, which was fitted up at the Canadian General Electric Works, Peterboro, with motors, etc., has left the shop and has been taken to Shawinigan Falls, Quebec. It has two trolleys when in operation, and there are four motors that provide power. Two men are required to operate it, and it travels at a speed estimated at 30 miles per hour with 30 freight cars as a load.

It is expected that Peterboro will shortly approach the Hydro-Electric Power Commission with regard to power. It is proposed to obtain this if possible from sources about twenty miles north of the city, and have practically the same plan worked out as at Ottawa. Failing in this, however, the commission may be asked to bring Niagara power to Peterboro. It is thought that perhaps 8,000 horse-power may be used annually.

The Ontario Power Co., Niagara Falls, contemplates the construction of another pipe line from the gate house at the Dufferin Islands to the power station at the bottom of the bank, a distance of about three-fourths of a mile. The line will cost about $700,000. This additional pipe line is made necessary because of the contract which the Ontario Power Company has executed with the Hydro-Electric Commission to supply the electric current to the Government transmission line. For some time there has been building a considerable addition to the power house below the bank to accommodate other units. The work of instaling the units and of laying the pipe line will be completed in time for the execution of the Government contract. Under the terms of its charter, the Ontario Power Company may develop 180,000 horsepower. At the present time the company is developing 75,000 horse-power, and the contemplated work will increase the output of the plant to 140,000 horse-power. The company has authority to export to the United States 60,000 horse-power, while at the present time but 30,000 horse-power is exported. The plant now has installed six units, three of 10,000 horse-power. The others, 12,500 units, have proved so satisfactory that the company is changing over the 10,000 units now. The new units which will be installed to develop the additional "head" will all be of the larger class.

Structural Steel.

A new steel bridge has been built across the Conestogo by the G.T.R.

A new steel bridge is being erected on Granville Street, Vancouver.

The Quebec Bridge Co. has become merged with the Federal Department of Railways and Canals and all its belongings transferred to the department.

The New Westminster city council has awarded the contract for the superstructure of Lulu Island bridge to the Canada Foundry Company for $26,831.25.

The new steel bridge at Van Vlack, in Simcoe county, will be 300 feet long, and built on concrete piers and abutments. It will cost about $15,000.

A by-law will be submitted to the people of Toronto in January, 1909, for the proposed expenditure of $215,000 on a bridge across the Don at Wilton Avenue.

A bridge over the Saugeen at a cost of $4,000 is to be built by the Town of Durham, debentures for which were approved by the Ontario Railway Board recently.

Plans have been prepared for the erection of a new concrete railroad bridge on the Owen Sound line, near the waterworks, Stratford. The bridge will in all probability be constructed next year.

A deputation consisting of members of the Edmonton and Strathcona city councils, will ask the Alberta Government to construct a bridge across the Saskatchewan river, similar to the one at Medicine Hat.

The Ontario Railway and Municipal Board has approved a by-law of the Town of Durham, providing for the issue of debentures to the extent of $4,000. The proceeds are to be used to erect a bridge across the Saugeen river.

City Engineer McLean, Strathcona, Alta., has been instructed by the council to prepare plans for a high level bridge over Mill creek, at the eastern extremity of Whyte Avenue, to provide a direct route into Strathcona from the Clover Bar District.

Regarding the proposed new Bathurst Street bridge it was proposed, at a meeting of the Board of Control, Toronto, to pay for this structure out of the taxes, in place of submitting a by-law to the people. In this case tenders would be called for at once. Estimated cost of bridge, $135,000.

Frederic Nicholls, general manager of the Canadian General Electric Company, of Toronto, was in Vancouver last month, and went over to New Westminster, where the tenders for the construction of the bridge from New Westminster to Lulu Island were opened. These tenders were so high that it was found an additional outlay of from $20,000 to $25,000 would be necessary, and the ratepayers will be asked to approve the expenditure of this sum before the contract is finally awarded. Subject to the ratification of the money-by-law, the tenders accepted were that of the International Contract Company, Seattle, for the sub-structure, at $29,642, and of the Canada Foundry Company, for the superstructure, at $26,831.25. The United States Steel Products Company's tender for the superstructure was the lowest, but as it was only $120 less than that of the Canada Foundry Company, it was decided to give the Canadian firm the preference.

Gas Items.

Seattle capitalists may establish a gas plant in North Vancouver.

New Westminster will have a new gas plant. It will cost about $80,000.

Waterford, Ont., is forming a syndicate, and will bore for natural gas.

The Provincial National Gas and Fuel Co. has paid $10,000 for a lease of 5,000 acres of marsh land south of Welland, and will prospect for oil and gas. They are preparing to drill a well to a depth of 3,300 feet.

The new building for the Bridgewater Gas Engine Company, at Bridgewater, has just been completed and the company is now instaling the machinery. The company is starting the operations at once and the first engine will be turned out about the beginning of the year.

A saving of $7,000 will be made this year by Toronto operating the civic gas lighting system. Prior to 1907 the lighting of the streets by gas lamps was let by tender. Since then, under municipal control, the lamplighters have received higher wages and the lights have given better service.

St. Catharines Board of Trade unanimously passed a resolution in favor of the conservation of Canada's natural gas supply, and asking the Governor-in-Council to pass an order prohibiting its exportation to the United States. An effort will be made to enlist co-operation of other municipalities interested in the question, because of a shortage.

The question of the gas producer was discussed by Kamloops council, when Frederick Nicholls, president of the Canada Foundry Co., Ltd., was present. The trouble was that the producer was not adapted to Bankhead coal, and in speaking of the matter, Mr. Nicholls stated that he would not shirk any responsibility. A sample of the fuel had been analyzed, but in some way the company had failed to hit off the exact producer required for that kind of coal. This the company would do, however, even if it cost more than the original figure named in the contract. It would take time and it would be necessary to supply a new producer especially designed to use coal from Bankhead, the cost being about $2,500. This extra expense would be borne by the company, which, in addition, would leave the city in possession of the old producer. Satisfaction was expressed by the city solicitor at the attitude adopted by the company.

Trade Notes.

The Standard Engineering Co., 43 Scott St., Toronto, manufacturers mechanical stokers and steam specialties, have opened a branch office at 234 Coristine Bldg., Montreal.

Jones & Glassco, Montreal, have installed Reynolds chain in the Dominion Wire Co.'s works, Montreal, on their wire-drawing machinery. Three chains transmitting 75, 125 and two 150 h.p. drives have been supplied.

M. E. Casey, for several years with Williams & Wilson, Montreal, has severed his connection with that firm and is now selling agent of the Berlin Machine Works, Hamilton, for the Province of Quebec. His address is 69 Staynor Ave., Westmount.

The Robb Engineering Co., Ltd., of Amherst, N.S., have recently received the following orders from Cobalt, Ont.: 1 30 h.p. Robb-Armstrong vertical engine. For the Colonial Mining Co., 1 75 h.p. Robb-Armstrong vertical engine. For the Temiskaming Mining Co., 2 100 h.p. Robb-Mumford water tube boilers.

The Toronto branch of the Dominion Foundry Supply Company has moved into larger quarters at 20 Pearl Street. The office and warehouse are now under one roof. F. J. Ross is the manager of this branch, which formerly had an office in the Traders Bank building and a warehouse at 122 Wellington St. West.

Quite a large instalation of electric traveling cranes has recently been completed in the plant of the Penn American Plate Glass Co., Alexandria, Ind. There are five 3-motor cranes in all, four being of 65-foot span, and one of 30-foot span. All the cranes were made and installed by the Northern Engineering Works, Detroit, Mich.

The Smart-Turner Machine Co., Ltd., Hamilton, have supplied the Robt. Simpson Co., Toronto, with a pair of their duplex outside-packed plunger pumps, with pot valves. Other companies supplied are, I.C.R., Montreal; Bechtels, Ltd., Waterloo, and G.T.R., Bracebridge. They are installing a 10-ton electric crane in the I.C.R. shops, River du Loup, Que.

The Dominion Mining Co., Tangier, have contracted with the Canadian Westinghouse Co., for a complete electric power plant including a 500 h.p. generator, motor, switchboards, etc. This plant will be operated from a water power about one mile from the mine, and all their operations such as pumping, hoisting, compressor, etc., will be driven by electric motors at a minimum cost for power and attendance.

The Whiting Foundry Equipment Co. have appointed as agents the United Steel & Equipment Co. Their territory includes British Columbia for the Whiting lines, including cupolas, foundry equipment and air hoists. Gorman, Clancey & Grindley have been appointed agents for Alberta and southeast British Columbia for cranes of various designs, air hoists, cupolas, foundry equipment for cast iron, malleable and steel foundries.

Wm. B. Mason, president, and W. A. Macleod, treasurer, of Mason Regulator Co., Boston, Mass., were in Montreal recently, establishing an eastern Canadian agency for their reducing valves and regulating devices. They appointed Peiler & McKenzie, 17 St. John St., Montreal, eastern Canadian agents. Among the lines handled are reducing valves, damper regulators, pump and elevator pressure regulators, steam engines and pumps.

The water committee of Montreal, at a special meeting, decided to take over the twelve million-imperial gallon Worthington steam pump. Very satisfactory duty tests have been made. The pump is designed to work against 93 pounds water pressure with steam at 140 pounds. There are two h.p. cylinders 21 inches in diameter, two i.p. cylinders 33 inches in diameter, and two l.p. cylinders 60 inches in diameter, the stroke is three feet. The water plungers are two in number, double acting and 29½ inches diameter.

The Hill Electric Switch Company, Limited, 1650 St. Lawrence Boulevard, have been awarded the contract to supply the new Workman building of McGill University with its equipment of main switchboard and panel boards. The panel board and cabinets for the new Eastern Townships Bank building in this city are also being built by the Hill Electric Company.

The Peterborough Lubricating Mfg. Co., Peterborough, have opened a sales and demonstration office at 127 Bay Street, Toronto. The office will be in charge of Alfred Cornwell as sales manager, and a full stock will be carried in Toronto. Fred T. Deville has been engaged as traveling salesman.

Planing Mill News.

A. D. Burrows has put up a planing mill at Eden Mills, Ont.

W. J. Travis is erecting a new planing mill in Wyoming, Ont.

J. W. Milligan is starting an apple barrel plant at Orillia, Ont.

W. E. Walsh has erected a sash and door factory at New Westminster, B.C.

The McMaster Lumber Co., of Kemptville, has decided to erect a new mill in Hull.

The Rowden Manufacturing Company will build a furniture factory in Guelph, Ont.

Brayden & Johnston are starting work erecting a sawmill at Canoe Creek Siding, B.C.

The Cooke Lumber Company, Nelson, B.C., is preparing plans for the erection of a sawmill.

The McMaster Lumber Co., Kemptville, Ont., will erect a large sawmill in Hull in the spring.

The Doak Manufacturing Co. has opened a new planing mill and sash and door factory in Nutana, Sask.

F. A. McCalum's sawmill at Rodney, Ont., has been destroyed by fire. Loss, $5,000, insured for $2,500.

The Empire Lumber Company's planing mill at Latchford, Ont., has been burned, with a loss of $30,000.

Mitchell Bros.' sawmill at Berkeley, Ont., has been burned with a loss of $8,000, and with only small insurance.

The Ross-Taylor Company have added to their planing mill at Exeter, Ont., a branch for the manufacture of boxes.

The planing mill of S. S. Cooper, of Clinton, Ont., was destroyed by fire on Dec. 22. The structure was a total loss.

Stracey & Garland's sawmill and woodworking business at Vancouver has been taken over by the Nimpkish Lake Logging Co., Ltd.

H. G. Bykhouse, Grand Rapids, Mich., has taken over the Humber River Pulp & Lumber Company's timber limits and sawmills at Deer Lake, Newfoundland.

J. W. Lowe & Son's woodworking factory, sawmill and adjoining buildings at Aylesford, N.S., have been totally destroyed by fire. Loss $25,000.

Reports from Buckingham, Pembroke, Aylmer and Braeside show that production of lumber in those towns will equal that of last year, about 75,000,000 feet.

The Baie St. Paul Lumber Company's limits and mills near Beaupre, P.Q., have been sold to an American syndicate, composed of F. A. Kernan, J. B. Coughlin and others, of Utica, N.Y.

Two cut-up mills owned and operated by the Inglewood Pulp & Paper Co., at Musquash, N. B., were destroyed by fire Nov. 27th. The loss is estimated at $22,000, and there was $13,000 insurance.

The Gibbons Lumber Company, at Pingston Creek, B.C., are increasing the capacity of their plant to about 60,000 feet per day, by the instalation of a new Waterous carriage saw frame and edger.

The sum of $150,000 has been expended by J. A. Sayward, Victoria, in adding to and equipping the Sayward mill, which has the most modern plant in the country. The capacity is 250,000 feet per day.

H. E. Ratz has installed in his saw and planing mill at St. Clements, Ont., machinery for manufacturing hoops and staves. He has also purchased the Millbank heading mill and will instal their sawmill machinery.

The Thompson & King Manufacturing Co., Ltd., is the new name of the River Street Boat and Planing Factory, Parry Sound, of which Messrs. Thompson & Griffiths were proprietors. Mr. Griffiths has retired and Frank King has taken his place.

Building Operations.

Vancouver will have a $30,000 isolation hospital.

Montreal will erect a new morgue to cost $15,000.

St. Catharines will erect a new $25,000 public school.

Brantford may build a new $100,000 Collegiate Institute.

The G.T.P. will build a $12,000 station at Wainwright, Sask.

F. A. Bean will erect a $100,000 oatmeal and flour mill in Regina.

The Northern Elevator at Glenboro, N.S., was burned on Dec. 10.

Moose Jaw will build a new fire hall at a cost of $35,000, in the near future.

Work has been commenced on the erection of a new post office in Prince Rupert.

Kirk & Co., manufacturers of aerated waters, will erect a new factory in Victoria.

The Cockshutt Plow Co., of Brantford, will erect a warehouse at Saskatoon in the spring.

Clayoquot, B.C., will erect a public hall.

Dundas, Ont., will build a Carnegie library.

Lethbridge will have a large new opera house.

Dryden, Ont., is erecting a new public school.

A new school will be erected in Clandeboyne, Ont.

The Salvation Army may build a hospital in Vancouver.

Lindsay is talking of erecting a new Collegiate Institute.

A $4,000 addition has just been added to the Havelock public school.

A new concrete wharf, 518 feet long, is being built at Lakefield, Ont.

The Church of St. John the Evangelist, London, will erect a new building.

The Methodists of Meaford have completed the erection of a fine new church.

Plans for the new Lutheran church to be erected in Brantford have been completed.

The new isolation hospital, London, is nearly completed. The cost of the structure was $22,000.

The Western Canada Flour Mills Co. will erect a warehouse in Winnipeg at a cost of $6,000.

McCoy & Wilford have just completed the construction of a $50,000 concrete dam at Bobcaygeon.

The Postum Cereal Co., of Battle Creek, Mich., will locate a Canadian branch factory in Windsor, Ont.

The plant of the Prairie City Oil Company, of Winnipeg, which was destroyed by fire recently, will be rebuilt.

The C.P.R. is completing negotiations for the erection in Fort William of the largest coal-handling plant in the world.

A school building will be erected and equipped at Strathcona, at a cost of $50,000, bonds for which have been already marketed.

The Copp, Clark Co., Toronto, will erect a large new factory to accommodate their printing, lithographing and book-binding plant.

Chicago and St. Louis capitalists will erect a handsome hotel in Kingston, providing they receive a bonus of $100,000 and a free site.

The Weber Gas Engine Co., Toronto, the Canadian branch of a United States company, have erected a $50,000 plant at Port Perry.

The Dominion Tack & Nail Co. have begun operations in Galt. J. C. Clapp and J. Etough, late of Montreal, are behind the industry.

The Colonial Wood Products Company, Niagara Falls, N.Y., have purchased 20 acres of land at Welland for the erection of a pulp mill.

The Morris Piano Co., whose factory at Listowel was burned recently, will rebuild. The ratepayers will vote on a by-law to loan the company $25,000.

A large storehouse of the Welland Vale Mfg. Co., St. Catharines, makers of hoe, rake, spade and other handles, was destroyed by fire on Dec. 4. The loss is $50,000.

Nelson City Council are negotiating with the Kootenay Motor Company and the Kootenay Jam Company, with a view to their establishing their plants in that city.

It is said that Milltown, N.B., may soon have an immense shoe factory. The Slater Shoe Co., of Montreal, the largest shoe concern in Canada, are negotiating for a site in Milltown, where there is great water power.

The new concrete bridge has been completed at Buckhorn, in Peterboro County. It is 400 feet long and in width is 14 feet clear. The dam beneath the bridge has also been finished. It is built of concrete with reinforced girders.

The Moncton city council is negotiating with the White Candy Company for the removal of their factory from St. John. The council has decided to submit an alternative proposal to grant exemption from taxation, free light, water, etc.

The A. R. Williams Machinery Company has decided to build larger and better quarters in Winnipeg. As a result it has closed a deal which gives it the ownership of a fine site. A fine new building, containing warehouse space and offices, will be erected.

The Lovejoy Plow Co., Cambridge, Mass., probably the largest manufacturers of steel plows in the world, will shortly open an agency at London, Ont. The agency, it is understood, will, in a short time, be followed by a branch manufacturing plant in London.

E. D. Smith & Co., Winona, Ont., will double their present plant. Work has already begun on a four-storey building, 90 by 50 feet, and this will be completed next spring. Mr. Smith will extend the scope of his business so as to include the manufacture of preserved fruit in glasses, and possibly unfermented wines.

Two banks and four industrial and commercial concerns will establish branches shortly in Saskatoon. Among the latter are John Deere Plow Company, of Chicago; the J. I. Case Thresher Company, of Hamilton; the Cockshutt Plow Company, of Brantford; the Gray Carriage Company, Chatham; the M. Campbell Fanning Mills Company, of Chatham; the Singer Sewing Machine Company; the Rat Portage Lumber Company, of Winnipeg; the International Harvester Company.

A new company has been formed in Amherst, N. S., which has bought the patent rights of Joseph Heaton, late of Hampton, N.B. The company purpose manufacturing acetylene generators and other articles in connection with heating. E. A. Chaters, of Sussex, and A. N. Charters, of Moncton, are on the directorate.

The Nova Scotia Carriage Co.'s plant at Kentville, N.S., has been purchased by McKay Bros., of Souris, P.E.I., who carry on quite an extensive business in the same line. They will operate the plant at Kentville after the first of the new year. The latter plant has been closed down for some time.

New Companies Incorporated.

The Wire & Cable Co., a Quebec incorporation, has been granted a license to do business in Ontario.

Oriental Woodwork, Limited, capital $100,000, Toronto; provisional directors, George Wilkie, Grant Cooper and John I. Grover.

Russell Harvesting Machine Co., Woodstock, capital $250,000; provisional directors, Wm. Russell, J. F. Russell and J. T. Burns.

The Standard Valves, Limited; capital, $20,000, Ottawa; provisional directors, Hugh Burnet, Fred W. Musgrove and R. S. Smart.

The Langdon-Davies Motors (Canada) Limited, an incorporation under the laws of Great Britain, has been licensed to do business in Ontario.

The Berry Pulverizer Co., capital, $100,000, Ottawa, provisional directors, Patrick H. Wall, Wm. J. Carson, M. W. Merrill and Austin Berry.

The Russell Harvesting Machine Co., capital $250,000, Woodstock, Ont., provisional directors, Wm. Russell, James Franklin Russell and J. T. Burns.

Point Anne Quarries, Limited, capital $500,000, Toronto; provisional directors, M. J. Haney, J. F. M. Stewart, Thos. Gibson, H. T. Hunter and E. P. Seon.

The Consumers' Gas Co., Wallaceburg, capital $40,000, has been incorporated. The provisional directors are David A. Gordon, H. A. Stonehouse and W. W. Hay.

Provincial charters have been granted to Canada Construction & Dredging Co., Ottawa Construction Co., and Union Construction Co. three corporations having Dominion charters.

Victoria Paper & Twine Co., capital $80,000, Toronto; provisional directors, C. F. Hubbs, W. H. Howe, H. J. Severance, R. W. Gallagher, Chas. V. Syrett, C. S. Nicholls and E. R. Mallalieu.

Manufacturers Corundum Co., capital $100,000, head office Toronto, has been granted a provincial charter. The provisional directors are, A. W. Holmested, F. H. Potts and T. A. Silverthorn, Toronto.

Marsh & Henthorn, Limited, capital $100,000, has been incorporated, with head office in Belleville. The company will carry on the foundry and manufacturing business of Marsh & Henthorn, Belleville.

The Ott Brick & Tile Manufacturing Co., capital $40,000, Berlin; provisional directors, Michael Ott, Conrad Ott, Casper Braun, C. Asmussen, R. Bierwagen, H. Dotzenroth, R. Pinke and August May.

Merkley Bros., Limited, capital $50,000, Cassel, Man., to carry on a lumber, saw and planing mill business. Provisional directors, Alex. Hugh Merkley, Duncan C. Merkley, Wm. Merkley, Adelard Dorais and Allan C. Gill.

The Advance Machine Works, capital $30,000, Walkerville, has been incorporated. The incorporators are, George Albert True, Edward Snover Reid, Frederick Albert Eckert, Henry Winslow Standart and William Van Moore, Detroit.

A provincial charter has just been granted to the Russell Harvesting Machine Co., Ltd., capital $250,000, with headquarters at Woodstock. The provisional directors are Wm. Russell, of Hamilton, and Jas. F. Russell and John T. Burns, now of this city.

The Thompson & King Manufacturing Company, capital $20,000, Parry Sound; to build boats, launches, deal in lumber, builders' supplies, etc.; provisional directors, A. A. Thompson, Edward Thompson, Frank King, Clara Thompson and Thomas Fraser.

Fisher, Robson Manufacturing Co., Alliston, Ont., capital $100,000, has been incorporated. The company will manufacture agricultural implements. Those constituting the company are R. Scott, T. M. Brown, W. A. J. Bell, W. J. Hill and C. S. Fisher, Alliston.

A charter has been granted to the Dain Mfg. Co., Welland, capital $200,000. The company will manufacture farm implements. The applicants for the charter are, J. Dain, P. Ferdinand Arbenz, and F. M. Hunter, Ottumwa, Iowa; B. J. McCormick and L. C. Raymond, Welland, Ont.

Canadian Patents, Limited, have been incorporated, with an authorized capital of $40,000, and head office at Ottawa. The incorporators are: George Hollis Megloughlin, William McGee Young, Arthur Nassau Molesworth, Fred William Musgrove, Ottawa, and William Alfred Wyman, Cumming's Bridge.

Letters patent have been issued to Messrs. E. J. Estes, G. S. Hart, F. H. Markey, R. C. Grant and W. G. Pugsley, of Montreal, for the organization of the Canadian Palace Car Co., with a capitalization of $1,500,000, to manufacture in Canada parlor, dining and sleeping cars, on rights obtained from the American Parlor Car Co., of New York.

The Canadian Palace Car Co., of Montreal, has been incorporated, with a capital stock of $1,500,000. The company was originally the American Palace Car Company, which passed into the hands of a receiver some months ago and which was finally absorbed by Canadian interests. The shareholders of the old company in Canada numbered nearly 450, and this will be increased by the formation of the new organization.

Cobourg Rolling Mills.

The main building of the steel rolling mills plant is almost completed, and it is expected that the works will be in operation about March 1st. This is a branch of a Pittsburg steel plate concern and as intimated in the December issue of Canadian Machinery, the main building is 350x80 feet. In addition, a power plant is being built. The machinery will be installed during February and thirty-five hands will be employed. This number will be increased as orders for work warrant it.

Tin Plate Industry.

R. Jenkins, of Swansea, Wales, is organizing the Welland Tin Plate Co., with a capital of $250,000, which will establish an industry in Welland, Ont. A fifteen-acre site will be given to the promoter and the concessions are asked in the form of a fixed assessment of $10,000, and water at cost. In return, four mills, 100x300 are to be built, and 250 men employed. One of the agreements is that Welland is to build 150 houses that will be needed by the workmen, as there are not enough houses in Welland at present.

World's Fair for Winnipeg.

The project of holding a world's fair at Winnipeg in celebration of the landing of Lord Selkirk's settlers is now taking shape. At the annual meetings of several organizations, including the Winnipeg Industrial Exhibition Association, the question was discussed and many practical suggestions offered, as well as substantial financial support in the undertaking. The general opinion throughout western Canada is that the project of holding a world's fair at Winnipeg deserves the encouragement of the Dominion and Provincial Governments, inasmuch as the progress and prosperity of the west would be advantageously exploited.

Handsome Calendar.

The Hamilton Facing Mill Co., Hamilton, have issued a handsome calendar, which contains a picture reproduced in size 10x16 inches from Ernest H. Riggs' picture "Eventide. This was one of the more important canvases at the 1906 London Royal Academy. The beautiful reproduction of nature created much comment in England's foremost exhibition. The picture shows the farmer, the day's work over, unhitching his weary team from the plow which he leaves in the furrow awaiting the coming of another dawn. Then, accompanied by his wife and child, who have come forth to meet him, he plods his weary way homeward to the warm supper and the glowing fire upon the hearth.

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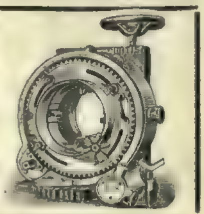

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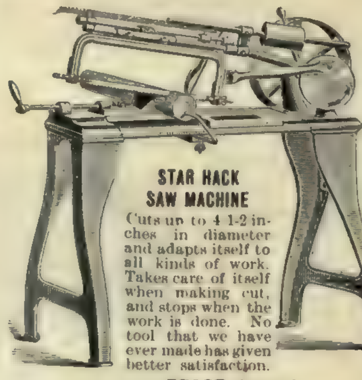

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MARINE gasolene engine castings, with blue prin and full instructions, etc.; 2½, 4, 6 h.p.; also complete finished outfits at $65 up; catalogue, Krug & Crosby, Hamilton. [10tf]

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ONE of the progressive Western contracting companies last year paid 40% cash from its manufacturing profits. The company is now extending to meet the heavy demand on the coast and now offers a small block of its stock at par. For full particulars, write Box 80, CANADIAN MACHINERY, Toronto.

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EXPERIENCED DESIGNER would like position in Canada as designer of pumps, air compressors, and small gas engines. Experience machinist, jig designer, and machine designer At present head draftsman for turbine builders in United States. Can reduce shop cost to lowest possible figure. Address Box 66, CANADIAN MACHINERY, Toronto. (10)

WANTED—Position as superintendent of foundry, wood and metal pattern departments, by practical up-to date reliable man of large experience. Expert on molding machines. Best of references. Would consider general superintendent position with small concern. Farm implement line. Apply Box 67, CANADIAN MACHINERY, Toronto. [1]

FOR SALE.

FOR SALE—Half interest in a foundry and machine shop, situated in a beautiful town in Ontario. Is a going concern, employing from ten to fifteen hands the year round, with no opposition. For particulars apply to Box 81, CANADIAN MACHINERY, Toronto. (1)

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General Electric Co.'s New Offices.

The Canadian General Electric Co. and Canada Foundry Co. have moved into their hand some new offices situated on the northwest corner of King and Simcoe Streets, Toronto. This five-storey structure was designed by Architects Darling & Pearson, Toronto. It is well equipped for the economic handling of the business of these two companies. The steam heating plant in the basement was installed by the Canada Foundry Co. and the chimney by Alphons Custodis, New York, represented in Canada by Eadie-Douglas Co., Montreal. The electric wiring was done by the Canadian General Electric, and the elevators were built by Otis-Fensom Co.

Big Hardware Transfer.

The old established wholesale and retail hardware business of Rice Lewis & Son, Toronto, has been purchased by R. C. Fisher and A. E. Gilverson. Mr. Fisher has until recently been general manager of the business, and Mr. Gilverson, secretary, of the company. Until the transfer is completed W. C. Crowther will remain as president, two representatives of the A. B. Lee estate and two of the John Ley estate remaining on the board along with Messrs. Fisher and Gilverson.

The five-storey building on the corner of King and Victoria Streets, will be sold, and the business concentrated in the larger building on Victoria Street, ground floor of which will be made a retail hardware and sporting goods store with about 150 feet of plate glass window display. Above this will be four floors for offices and wholesale warehouse, with a stock of metals and a storehouse for other goods on Atlantic Avenue, with railway siding connections.

The plans for the removal from the corner building were made a couple of years ago, the firm having eighteen years ago co-operated in widening the lane beside their building to an extension of Victoria Street. The recent fire has brought the plans to a head and early next year will see the new heads of the firm installed in a modernly equipped building remodelled to suit the requirement of their wholesale and retail and machine tool departments.

Machinery Markets

THE WEST.

At the present time there are many matters of public interest claiming attention, and not the least of these is the final agreement between the Canadian Pacific Railway and the Town of Fort William.

The company's old exemption from taxation agreement expires this year, and negotiations have been in progress for some time for a new agreement, the details of which have finally been made public. The company are to have a further exemption on their property, from everything but school taxes, for a further period of fifteen years, and in return are to build a joint railway, passenger, vehicular and trolley bridge across the Kanninstikwia to Island No. 1, a bridge across the McKellar connecting the two islands, build a fine union depot with G.T.P., give the city 300 feet river frontage at the foot of McVicar, and another 300 at the foot of Sprague Street, for city docks.

Lastly, the company will erect an additional rapid coal handling plant. Though not definitely stated, it is understood this will have a capacity of 1,000,000 tons, and will erect a large cleaning elevator. This programme outlines an immense forward movement at the head of the lakes for the next three years at least. The amount of structural steel required will represent a small fortune in itself, to say nothing of the other building materials and the number of men that must necessarily be employed. The agreement is considered very advantageous to both parties. Improvements at Fort William that tend to the rapid handling of wheat outward and coal inward, are of such vital importance to the west that the terms of the agreement have been studied almost as anxiously by Winnipeg business men as they have by those of the town by the lakes.

A matter that is of immense interest to the building trade of the west, and more especially to that of Winnipeg, was the merger effected recently of a number of the smaller stone quarries into the Garson Quarry Company, Limited. The new organization will have a capital of $250,000, and it is expected that the output will be increased by about 300 per cent. The principal quarries are located at Tyndall, which is only 26 miles east of Winnipeg. At present the equipment of this quarry consists of three gangs of saws and one planer, and it is now proposed to increase this equipment by two double diamond saws, one single diamond, four planers, two lathes and pneumatic tools. Thus equipped this quarry will be the largest in Canada and one of the largest on the continent of America.

MONTREAL.

Although in some quarters the lull incidental to the end of the year holidays and first of the year inventory taking has been noticed in the slightly decreased number of inquiries, the machinery market for this district is brisk. There have been no orders of unusual size taken but the number of small or medium-size orders placed in December have been better than those for the preceding two months. One house stated that the business done in December up to the 22nd was larger than that for the whole of any other month in the year, with inquiries numerous. Prices show a tendency to advance, owing to the manufacturers growing busier. The machine tool outlook is bright, but the dealers do not look for much increase until after the year-end inventories have been taken. Not a few of the inquiries received are from those who, in taking stock, desire a price on a certain machine, merely for the purpose of comparison in appraising their own.

Wood-working machinery, in some cases, is moving faster at the present time than the iron-working machines, notwithstanding the fact that this time of the year is usually a slack one for machines of this class. The majority of dealers report machinists' tools to be moving well, while the outlook for machinery supplies is optimistic. One maker of oil furnaces and other oil-burning apparatus reports their factory working night and day shifts to keep pace with orders following closely on the heels of inquiries.

The foundry supply trade is a little slow at present, although inquiries are increasing, which seem to indicate a good increase in future business. In this line there are two or three large undertakings hanging fire in this district, that will probably be settled after the beginning of the new year. There are movements under way for the establishment of two large branches of foreign manufacturing plants in this city, which will undoubtedly increase wood and iron-making machinery orders from here.

The demand for grey iron castings is increasing favorably the bulk of the sales being small, light pieces.

The tool steel trade is quiet, but it is easy to see that the new year will bring renewed activity along this line. The recent depression which prevented large stocks being carried is a thing of the past and those stocks having to be replenished will show large increase in sales of tool steel.

TORONTO.

There is a buoyant feeling among the machinery dealers on account of increased inquiries for machine tools. The business during the past two months has exceeded any other two months during the year. This is very encouraging, especially in view of the fact that business is usually dull during this season. Many establishments take their stock inventories at this time of the year. On this account the demand for tool steel has been quiet, the manufacturers desiring to keep the stock low for that reason, and there is little tendency to place orders for machinery.

Several new machine shops have been opened up in Toronto and through western Ontario and were supplied through Toronto houses. Several new factories are planned for Toronto and western Ontario, which makes the business outlook good for next spring. Business has been growing steadily and the character of the inquiries indicates a good opening for the first months of 1909.

BOOK REVIEWS.

MACHINE SHOP CALCULATIONS. By Fred H. Colvin, 174 pages, illustrated, published by Hill Publishing Co., 505 Pearl Street, New York. Price, $1.

The book gives a clear and simple explanation of the calculations necessary to solve practical machine shop problems. The chapters deal with fractions, pulley speeds, thread calculations, machine speeds, measurement of angles, vernier, micrometer, etc.

MECHANICAL WORLD DIARY—Dairy for 1909 from Emmott & Co., 65 King Street, Manchester, Eng. Price, 6d. 395 pages, being the 22nd annual issue.

The book contains valuable information on boilers, steam engines, engine room accessories, superheated steam, castings, turbines, gas engines, valve data, rope and belt drive, gearing, etc. Friction clutches are dealt with in a comprehensive manner and a section on chain drive has been added.

CATALOGUES.

UNIVERSAL RADIAL DRILL—Circular from the Fosdick Machine Tool Co., Cincinnati, illustrating and giving full specifications of their 4, 5 and 6-ft. half and full Universal radial drill.

FRICTION CLUTCH—Catalogue G. from the Hill Clutch Co., Cleveland, O., describing and illustrating friction clutch pulleys and couplings together with the necessary accessories and extra parts and costs of same. Some useful tables, such as standard key seats, are also included.

ROLLER BEARINGS — Folder from Hyatt Roller Bearing Co., Newark, N.J., telling how to reduce friction.

AUTOMATIC SCREW MACHINE—Folder from National Acme Mfg. Co., Cleveland, Ohio, describing the No. 515 machine with chuck of 9-16 inch capacity.

AUTOMATIC SCREW-DRIVER — Folder from Reynolds Machine Co., Rock Island, Ill., describing Reynolds automatic screw-driver for wood or machine screws.

AIR TOOLS—Circular L., from Independent Pneumatic Tool Co., Chicago, describing Thor pneumatic tools, including piston air drills, hammers, one-piece riveting hammers, etc.

REAMERS—Catalogue of Peerless high-speed reamers from Cleveland Twist Drill Co., Cleveland. Standard sizes and prices of hand, straight-shank chucking, expansion chucking, taper shank, core, shell reamers, etc., sockets and wrenches. These tools are also made to order.

DIE CAST PARTS—Catalogue from H. H. Franklin Mfg. Co., Syracuse, N.Y., illustrating the use of die cast parts for telephones, electrical apparatus, automobiles, time recorders, adding, calculating machines, etc., and for all devices requiring intricate parts.

COLD METAL SAW—Catalogue from Lea Equipment Co., 136 Liberty Street, New York City, describing belt and motor-driven metal saws and automatic grinders.

TOPSPEED PLANERS—Catalogue from Bateman Machine Tool Co., Hunslet Planer Works, Leeds, England. This catalogue is well printed on heavy paper and illustrated. It contains descriptions of their regular planers, and of their rail planer, drives, formulae and running costs.

BELTING—Price list of belting from Sadler & Haworth, Montreal and Toronto, manufacturers of oak-tanned belting.

A. C. GENERATORS—Bulletin No. 1038 from Allis-Chalmers-Bullock, Montreal, describing various types, details of construction, tables of sizes with speeds, etc., are given and numerous illustrations of instalations.

HIGH POWER MILLERS—Handsome catalogue from Cincinnati Milling Machine Co., Cincinnati, on heavy coated paper, describing and illustrating their new horizontal and vertical millers made in four styles of drive. These machines embody a number of entirely new features and are built on the unit system so that one style of drive may be changed to the other if advisable.

ELECTRIC LOCOMOTIVES—Special publication 7061 from Canadian Westinghouse, Hamilton, describing and illustrating in detail Baldwin-Westinghouse electric locomotives for mine and industrial service.

MANGANESE STEEL CASTINGS—Pamphlet from American Brake Shoe & Foundry Co., 405 Western Union building Chicago, Ill., listing the steel castings which they are prepared to supply.

POWER TRANSMISSION—Catalogue No. 24 from the A. R. Williams Machinery Co., Ltd., Toronto, 121 pages, illustrated, listing in full their lines of power equipment, including hangers, bearings, pulleys, clutches, belting, gears, hoisting ropes, etc.

MELTING FURNACES—Rockwell Furnace Co., New York, catalogue on heavy paper, well illustrated, describing melting furnaces for melting all metals, tinning, galvanizing, tool hardening, etc., oil burners, oil fuel pumping systems and pressure blowers.

FOUNDRY EQUIPMENT — Whiting Foundry Equipment Company, Harvey, Ill., catalogues 43-55, containing 243 pages, well illustrated, showing electric and hand-power cranes, pneumatic hoists, cupolas, crane ladles and other foundry equipment. The Whiting cupola is described in detail with sectional views and a diagram showing general dimensions.

The High Speed Milling Cutter With Inserted Blades*

Steps in the Development of a High Speed Steel Helical Blade Milling Cutter, with Inserted Blades for High Powered Milling Machines.

By WILFRED LEWIS and WM. H. TAYLOR.

It has long been recognized that the process of milling is superior to any other for machining metal because the metal can be removed at a much higher rate of speed than by any other method,

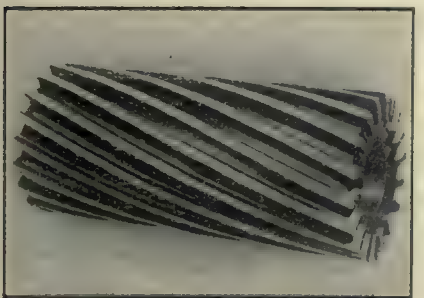


Fig. 1.—High Speed Inserted Steel Helical Blade Milling Cutter, 8 in. Diameter, 3½ in. Bore, 18 Blades.

and as the operation of cutting is continuous, milling cutters being made up of a multiplicity of cutting edges, work can be machined at a much lower time cost. After the advent of high-speed steel, builders of milling machines, especially those of the planer type, began to offer high-powered milling machines, and to-day it is a very common thing to see a milling machine whose spindle is

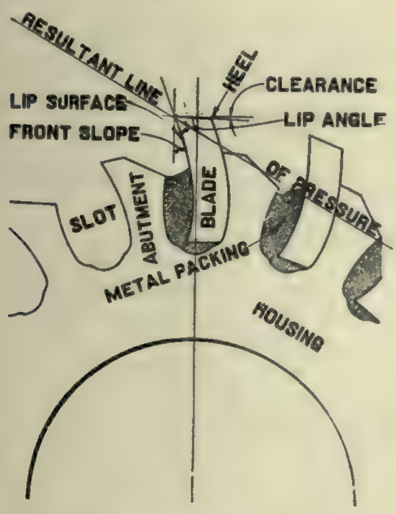


Fig. 2.

driven by an individual motor of from 50 to 75 h.p. capacity, whose platen is driven by an independent motor of from 7 to 15 h.p. capacity and whose cross-rail is raised and lowered by an individual motor of from 3 to 5 h.p. capacity. While the milling machine has been developed to high power and high speed, the milling cutter has not advanced as rapidly; the user is thus confronted with a very unsatisfactory condition, the output of his milling machine being limited to cutters of inadequate capacity. This condition results from faults of design lying in the shape of the blade and method of fastening. This criticism applies to the inserted blade type of cutter, which by reason of its cheapness in first cost and maintenance has been universally adopted for heavy slab milling.

In 1892 George Brechtol developed a

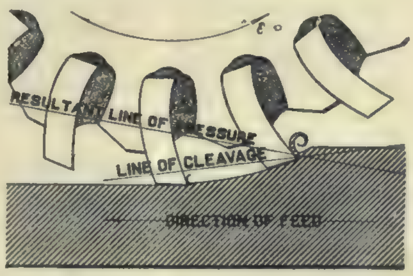


Fig. 3.

milling cutter of the inserted-blade type, in which the blades were made of carbon steel, properly shaped and secured. The results obtained at the time were considered extraordinary, being far in advance of those obtained by other types of carbon steel cutters. His cutter consisted of a malleable iron core, bored and keyseated, into whose body were planed 8 helical dove-tail grooves, considerably wider than the blades. The blades were bent around a cylinder to the desired helix. They were set inside a cylinder and properly spaced by means of blocks; the core was then set in position and soft metal poured, filling the dove-tail grooves and the spaces between the blades.

C. D. Peck was the first to develop successfully a milling cutter of the inserted-blade type for heavy slab milling, having high speed steel blades, helical in shape. The paramount feature in Mr. Peck's cutter was the helical shape of the blades. He planed helical slots, rectangular in shape, in a steel housing, inserted therein high speed steel blades bent to fit the helix of the slot, and held them in a rigid position by means of wedges inserted at intervals between the front face of the blades and the side of the slot, filling the spaces

Fig. 4.

between the wedges with soft metal. Mr. Peck designed and built a hand press for bending the blades, which consisted of a pair of lateral jaws encircling a shaft; one of them stationary, the other actuated by a lever and toggles so as to close upon the blade to form a helix.

His first cutter was built at the Pittsburg works of the American Locomotive Company in 1905, and from tests made at the time, the results were far in excess of those obtained from other types of milling cutters with inserted blades, both in material removed in a specified time and in power consumed per cubic inch of material removed. He proceeded to build more cutters and put them into use, having conslusively demonstrated by continuous operation that the capacity of these cutters for removing metal was not only far greater than that of other types of inserted blade cutters, but in excess of the capacity of

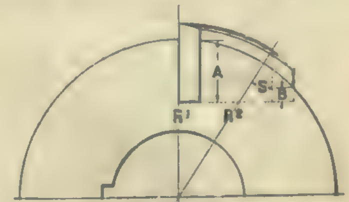


Fig. 5.

the modern type of high-powered milling machine.

Early in 1907 Mr. Peck had a conference with the manufacturers of the Taylor-Newbold cold saw, who were developing a milling cutter of the inserted-blade type, and the conference resulted in Mr. Peck turning his developments over to the Taylor-Newbold people. It

* Paper read at the New York meeting of the American Society of Mechanical Engineers.

was from this combination that the milling cutter about to be described was evolved. See Fig. 1.

Our primary investigations showed that there was no existing standard, or suitable rule, governing the construction of milling cutters with inserted blades, nor was there any record of exhaustive tests made to determine the most effective pitch, proper clearance angles, or front slope and lip angles to be employed, and judging from past and present constructions in milling cutters of the inserted-blade type, the functional elements are merely arbitrary selections to suit individual tastes.

We also found the prevailing practice in constructing milling cutters with inserted blades to consist of cutting rectangular slots in a cylindrical housing, the slots lying in a plane angular to the axis. The angle from the axis at which the plane is set varies from 5 to 25 degrees, according to the length and diameter of the housing. The blades are straight pieces of high speed steel, which are ground off after being inserted in the slots until a definite projection from the housing along the cutting edge is attained, after which clearance is obtained by "backing off."

The blades are held in position by various methods, such as clamps placed between each alternate pair of blades and drawn inward by screws; or by cutting grooves in the abutment between each alternate pair of blades and forcing the parted abutments by means of taper screws to clamp the blades on either side; or by driving wedges between the front face of the blade and the side of the slot; and by numerous other means.

We also found that much can be learned and applied to milling cutter blades from the development of the lathe and tool, especially the round nose tool; a fact totally ignored by the manufacturers of milling cutters, who still try to accomplish the impossible—that is, setting a straight blade in a slot with its front face in a plane angular to an axis, throughout its length the proper front slope and lip angle, and define a helix on the line of the cutting edge.

The first point which we considered in constructing the cutter to be described was the shape of the blade, with the following conclusions: To maintain a

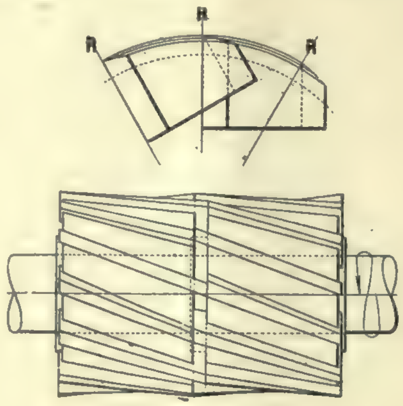


Fig. 6.

prescribed slope and lip angle throughout its entire length, the blade must be bent to form a helix, and by so shaping it all angles and the contour of both blades and slot would be constant over their entire lengths. Again, with the blades helical in shape, a continuous cutting edge with a constant lip angle would be maintained throughout any length of cutter.

The second point for consideration was the pitch or lead of the blade, and from experiments with various leads we found an effective angle for the helix to be about 20 deg. To facilitate computation, we adopted the formula, diameter multiplied by 9 equals pitch, which would develop 19 degrees 15 minutes as the angle of the helix.

The third point was the form of the grooves in the cutter blank. These had previously been placed approximately rectangular in section with a slight amount of undercutting to hold the blade and the wedges used for fastening it in place. It occurred to one of us, however, that this grooving of the cutter blank could be done better and faster by milling than by planing, and that an undercut groove might be produced at once by a saw set in a certain relation to the cutter blank. This suggestion was soon proved practicable, and although the groove so formed was not so easily fitted with a cutter blade on account of its curved sides, the curved sides gave the cutter a lip angle which was of great value in actual service. To form the blades accurately to the shape of the groove, it was necessary to design a bending machine of great power, capable of squeezing the blades at once to proper form not only as helices of correct pitch, but of correct curvature in a direction normal to the helix.

This machine was made to act in one way like the original hand-bending machine made by Mr. Peck, but in addition to the lateral jaws which closed on the blade to form the helix, it was provided with a cap which snapped quickly upon the lateral jaws, completely enclosing the blade being bent to proper form. Time is such an important element in the handling of high-speed steel that the value of this bending machine, which was quick enough to act before the temperature of the steel had fallen below the working point, can hardly be over-estimated.

Special furnaces for treating our blades were designed and built under the Taylor-White patents, but we are not at present so much concerned with the ap-

TABLE 1 SLAB MILLING CAST IRON. TAYLOR-NEWBOLD HIGH-SPEED STEEL MILLING CUTTER, 8-IN. DIAMETER, 18-IN. FACE 18 INSERTED BLADES. TEST MADE AT BEMENT-MILES WORKS, JULY 13, 1908

MACHINE USED: 42-IN. BEMENT-MILES MILLING MACHINE
DRIVING MOTOR: WESTINGHOUSE DIRECT-CURRENT CONSTANT SPEED TYPE 40-H.P. AT 220 VOLTS, 153 AMPERES
MATERIAL CUT: CAST IRON TEST BLOCK, 15 IN. WIDE, 36 IN. LONG

Number of test	Cut: Feed: Table advance per minute Inches	Cut: Feed: Advance per blade Inches	Cut: Depth Inches	Cut: Width Inches	Cut: Material removed: Cubic Inches per minute	Cut: Material removed: Pounds per minute	Cut: Material removed: Pounds per hour	Duration of test	Speed of Cutter: R.p.m.	Speed of Cutter: Feet per minute	Electrical Readings: Driving motor: Amperes	Electrical Readings: Driving motor: Volts	Electrical Readings: Driving motor: H.p.	H.p. per cubic inch removed
1	3½	.00636	½	15	26.25	6.83	410.13	10m. 2s.	25	53½	150	200	40.21	.53
2	5⅞	.01332	½	15	44.06	11.47	688.38	6m. 8s.	24½	51½	150	220	44.23	1.00
3	7½	.01736	½	15	56.25	14.74	737.33	4m. 48s.	24	50¼	160	208	44.70	0.794
4	6⅛	01361	½	15	45.93	11.96	717.72	5m. 5s.	25	53½	175	208	48.79	1.060
5	7¾	.01722	½	15	58.12	15.13	908.14	4m. 39s.	25	53½	225	200	60.32	1.030
6	7⅞	.01781	11/16	15	50.70	13.20	792.13	4m. 53s.	23	48	260	204	70.96	1.390
7	7⅞	.01781	11/16	15	50.70	13.20	792.13	3m. 39s.	23	48				
8	8	.01851	11/16	15	82.50	21.48	1288.98	1m. 15s.	24	50¼	240	213	68.52	.830
9	7	.01760	1	15	105.00	27.34	1640.52	3m. 17s.	22	47	350	190	89.14	.849

paratus for manufacture as with the results obtained.

The fourth point for consideration was the method of securing the blades. Mr. Peck's experiments showed metal wedges to be neither satisfactory or economical as a means of securing the blades. While installed with ease they are exceptionally hard to remove when necessary to replace blades, owing to their tendency to imbed themselves in the housing. Furthermore, by driving them in at intervals along the high speed steel blade intermittent strains were developed, causing the blade to crack and spall off at the point of contact between the wedge and blade when under cutting pressure. Other mechanical fastenings were debarred either by excessive cost or by inability to withstand vibration and remain rigid.

Experiments were made with various alloys until a proper combination was obtained, capable of flowing freely, cooling without shrinkage, withstanding great strains without crumbling and being removed quickly and economically.

A device was designed for compressing the alloy in the slots after it had been poured, and a device for removing the alloy when replacement of blades is necessary. With the alloy compressed in the slots we are able to secure the blades in an anchorage sufficiently rigid so that the blades may be broken off by sheer force without affecting it. This form of construction enables us to produce a cutter of moderate diameter free from torsional strains and with a greater number of blades for a given diameter, and possessing a capacity in excess of the requirements of high-powered milling machines.

The milling cutter in question will be referred to here as a "Helical" rather than a "Spiral" cutter. The prevailing practice is to use these terms synonymously, but geometrically they are not even analogous; a helix is a line generated by progressive rotation of a point around an axis and equidistant from its centre, while a spiral is generated by progressive rotation of a point around a fixed axis with a constantly increasing distance from the axis.

Fig. 2 shows the meaning of the following terms: Housing body of cutter; abutment—support of blade; metal packing—anchorage; slot; blade; heel of blade; clearance angle; lip angle; front slope; lip surface and resultant line of pressure. The side slope is defined by the angle of the helix.

Fig. 3 shows how the chip is partly torn and partly sheared from body of forging, the cutting edge of blade not being under heavy pressure. Our experiments hgve shown conclusively that the closer the centre of pressure of the chip is to the cutting edge, the greater its intensity, and the generated heat is largely concentrated towards the cutting edge, where the sectional area to carry it off is much less. Then again the frictional heat generated by lack of back slope becomes so great as to cause cohesion between the chip and the cutting edge. Under heavy pressure we have seen a compact of chip and blade which was virtually inextricable, so that when disunited from the blade the cutting edge still adhered to the chip. To eliminate this condition where straight blades are employed, the practice is to set the front face of the blade slightly back of a radial plane (see line R, Fig. 4) to assure a front slope. It is well known that the absence of front slope eliminates any proclivity which the lip may have to develop a line of cleavage and thereby throw the pressure of the chip back on the lip surface from the cutting edge.

Fig. 4 shows a constant lip angle L throughout the entire length of the blade which is set at an angle of 20 deg. to an axial plane, this angle remaining constant throughout any length by reason of the blade's curvature.

In Fig. 5 a straight blade is set in a plane radiating from the axis, designated by line R1, and by carrying it across the face of the housing at an angle set at 20 deg. to an axial plane. You may observe the development from no front slope to a positive front slope, designated by the letter S. In milling, a blade with this irregularity in front slope causes the cutter to drag on one side and gouge on the other. Blades of this type cause excessive vibration to the cutter, due to the varying angle of the front slope, and necessarily consume more power. It has been contended that by nicking the blades to alleviate the tendency of the blade to gouge and drag, and to define a more even pressure throughout the line of the cutting edge, less power would be required to drive the cutter; the assumption being that less power would be consumed in breaking up the chip than would be required by a continuous cutting edge producing a continuous chip.

We differ with this contention, having demonstrated conclusively by experiments that the initial fault is caused by absence of front slope, and that an undesirable feature is developed by nicking the blades. The blade behind the nick whose cutting edge covers the gap formed by a nick in the blade preceding must accept double the feed; this causes chatter and produces an uneven machined surface.

It is also a fact that when a rectangular slot is cut in the face of a housing at an angle of 20 deg. to an axial plane, its depth becomes gradually less as it progresses across the face, until it reaches a vanishing point designated by lines A and B in Fig. 6. This condition not only limits the width of the cutter and necessitates a housing of large diameter when a medium width of cutter is required, but develops an anchorage possessing the required strength and rigidity at one side and decreasing in proportion to the length of blades at the other. Where a wide face is required it is necessary to construct a cutter composed of a number of sections.

TABLE 2 SLAB MILLING STEEL, TAYLOR-NEWBOLD HIGH-SPEED STEEL MILLING CUTTER, 8-IN. DIAMETER, 18-IN. FACE, 18 INSERTED BLADES. TEST MADE AT BEMENT-MILES WORKS, JULY 14, 1908

MACHINE USED: 42-IN. BEMENT-MILES MILLING MACHINE
DRIVING MOTOR: WESTINGHOUSE DIRECT-CURRENT CONSTANT SPEED TYPE 40 H.P. AT 220 VOLTS, 153 AMPERES
MATERIAL CUT: 30 PER CENT CARBON STEEL TEST BLOCK 18 IN. WIDE, 20 IN. LONG

Number of test	Cut							Duration of test	Speed of Cutter		Electrical Readings			H.p. per cubic inch removed
	Feed				Material Removed						Driving Motor			
	Table advance per minute Inches	Advance per blade Inches	Depth Inches	Width Inches	Cubic Inches per minute	Pounds per minute	Pounds per hour		R.p.m.	Feet per minute	Amperes	Volts	H.p.	
1	11¼	.01785	3/16	18	31.64	8.96	537.81	1m. 47s.	35	73½	190	220	56.03	1.77
2	11¼	.01785	5/16	18	63.28	17.92	1075.62	0m. 11s.	35	73½				
3	6⅜	.01041	[illegible]	18	43.03	12.19	731.44	1m. 30s.	34	71	300	195	78.41	1.82
4	7	.01080	[illegible]	18	47.25	13.38	801.15	1m. 26s.	36	75½	400+	180	96.51	2.04
5	7	.00925	⅜	18	47.25	13.38	801.15	2m. 51s.	42	88	370	187	92.74	1.96

Fig. 6 illustrates a cutter with straight inserted blades made up in sections, each alternate blade overlapping the blades in the opposite section, so as to obtain the desired width of face. The sections are so set that the cutting edge forms a continuous line. Above the cutter is a diagram showing the relation of the blades in one section to those in the other.

Too much stress cannot be laid on the use of lubricant during the process of milling. A copious stream of lubricant falling at slow velocity should be thrown directly upon the chip at the point of removal. Heat generated by the pressure of the chip is the chief cause for wear, and if allowed to become too great it will soften the lip surface of the blades and cause them to crumble or spall off. An ample supply of lubricant during the milling operation carries off the heat, materially lessening the dulling of the cutting edges.

From our experiments and those of others it has been conclusively shown that a gain of 33 per cent. in the cutting speed in milling steel and wrought iron is made by throwing a heavy stream of lubricant upon the cutter and along its entire face; and a gain of 15 per cent. in milling cast iron. The piping for conveying the lubricant to the milling cutter should be arranged with nozzles spaced about 4 in. apart, in sufficient number to cover the face of the cutter. The main supply pipe to the nozzles should be large enough to supply each nozzle with from two to three gallons of lubricant per minute. The general arrangement, size of supply pipe and number of nozzles will be regulated by the width of the machine and the nature of the work to be done.

In the more recent designs of slab milling machines due consideration has been given to lubrication. The platen is drained by gravity to a tank located at the side of the machine, from which the lubricant is raised by a pump to a reservoir formed by the cross-piece at the top of the housings, to which is attached the nozzle bracket that conveys the lubricant to the required point of gravity.

In the tabulated tests the amount of power consumed by the milling machine will be given as read from the voltmeter and ammeter. Dynamometer readings of the actual power exerted at the spindle, or the power consumed by friction in the gearings and bearings, will not be given consideration; the user being most interested in the commercial readings that indicate the power for which he has to pay.

TABLE 3 MILLING CHANNELS, TAYLOR-NEWBOLD HIGH-SPEED STEEL MILLING CUTTER 4⅜-IN. FACE, 8-IN. LISTED DIAMETER, 8⅜ IN. ACTUAL DIAMETER, 18 IN. INSERTED BLADES, 3½-IN. BORE. TEST MADE AT BEMENT-MILES WORKS, OCTOBER 20, 1908

MACHINE USED: 42-IN. BEMENT-MILES MILLING MACHINE
DRIVING MOTOR: WESTINGHOUSE DIRECT-CURRENT CONSTANT SPEED TYPE 40-H.P. AT 220 VOLTS, 153 AMPERES
MATERIAL CUT: 35 PER CENT CARBON STEEL FORGING

Number of test	Cut							Duration of test	Speed of Cutter		Electrical Readings			H.p. per cubic inch removed
	Feed		Depth Inches	Width Inches	Material Removed				R.p.m.	Feet per minute	Driving Motor			
	Table advance per minute Inches	Advance per blade Inches			Cubic Inches per minute	Pounds per minute	Pounds per hour				Amperes	Volts	H.p.	
1									39	82.95	35	220	10.32	
2	6⅞	.01320	5/16	4⅜	9.40	2.66	159.78	3m. 25s.	37	78.69	85	200	22.74	2.42
3	1 15/16	.00307	1	4⅜	8.48	2.40	144.14	7m. 12s.	35	74.44	95	185	23.56	2.77
4	1½	.00231	1	4⅜	6.56	1.86	111.51	4m.	36	76.57	85	193	21.85	3.33
5	2⅝	.00394	1 5/16	4⅜	15.07	4.27	256.15	2m. 40s.	37	78.69	113	200	30.29	2.00
6	3⅝	.00544	1 5/16	4⅜	20.81	5.89	353.72	1m. 56s.	37	78.69	135	195	35.28	1.69
7	5	.00750	1 5/16	4⅜	28.71	8.13	488.01	1m. 24s.	37	78.69	200	190	50.93	1.77
8														

ELEMENTS IN THE VALUE OF A MANUFACTURING PLANT.

By Charles T. Main.

Into the market value of a plant enters the broad element of location, with its varying hours and price of labor; skill and abundance or scarcity of operatives; cost of transportation of raw material, supplies, and finished product; cost of fuel or power; cost of construction and equipment; and rate of taxation. Also the narrower and more restricted element of the physical condition of the plant and its relative value to a new plant constructed upon modern principles, and constructed with all regard to the economical production of a finished product of the best quality of the goods manufactured. The standard of value should be a modern mill so constructed and located as to avail itself of as many combined advantages as possible.

The ultimate value of a plant is its capability of producing a profit, and into the possibility of producing a profit enter all of the above items and perhaps some not mentioned.

The question of management is a personal one, and must not enter into the problem, except so far as to make sure that with good management the business would be successful. The business of a large and valuable plant might be conducted in such a manner as not to realize a profit; but it might, nevertheless, have a great value, and would bring a large amount if offered for sale. On the other hand, a plant not nearly so valuable might, with skilful and close management, yield a profit; but if offered for sale would bring very little. Although the past profits of a concern will have some influence in determining its value, that is not a measure of its value; because a purchaser might by different management reverse the profit or loss, or the changes, real or anticipated, in trade might do the same thing. We must therefore eliminate as far as possible all personal equations from the problem.

PERSONAL.

Mr. Arthur Knight, formerly superintendent of the foundry of the Manitoba Iron Works, Winnipeg, Manitoba, Can., has taken charge of the foundry of the Canadian Northern Railway Co., of that place

W. O. Barnes, M.E., engineer in chief of the Ross Rifle Company, Quebec, has resigned and will form a company to manufacture gas engines of his invention for which he has obtained Canadian patent rights.

Mrs. Frances A. W. McIntosh, formerly advertising manager of the Buffalo Forge Co., and associate companies, has resigned that position to open an office at 103 Anderson Place, Buffalo, where her services, in the preparation and printing of advertising literature can be secured.

A Boring Mill and Planer Combination for Large Work

A Home-made Boring Mill used in Combination with a 72" Planer. Construction of the Mill and Class of Work Finished on the Machine.

The Smart-Turner Machine Co. of Hamilton, are builders of all kinds of pumping machinery and do a general machine business. Among other things they manufacture for the Canadian trade, a cold tin setter for a United States firm. This is a heavy hydraulic machine weighing approximately 7 tons finished. The first lot of these were machined in a brake lathe of 6 in. swing. The head of the lathe was raised and the assembled tin setting machine bolted to the face plate, and its outer ring view on roller bearing bolted to the foot plate of the lathe. This did a fair job, but was slow, the time taken being about 80 hours. The heads of the firm designed the boring mill shown in place on the planer bed in the half-tone, Fig. 1. This machine has reduced the time of machining to about 18 hours, and does better work. It has also been used to good advantage on other work.

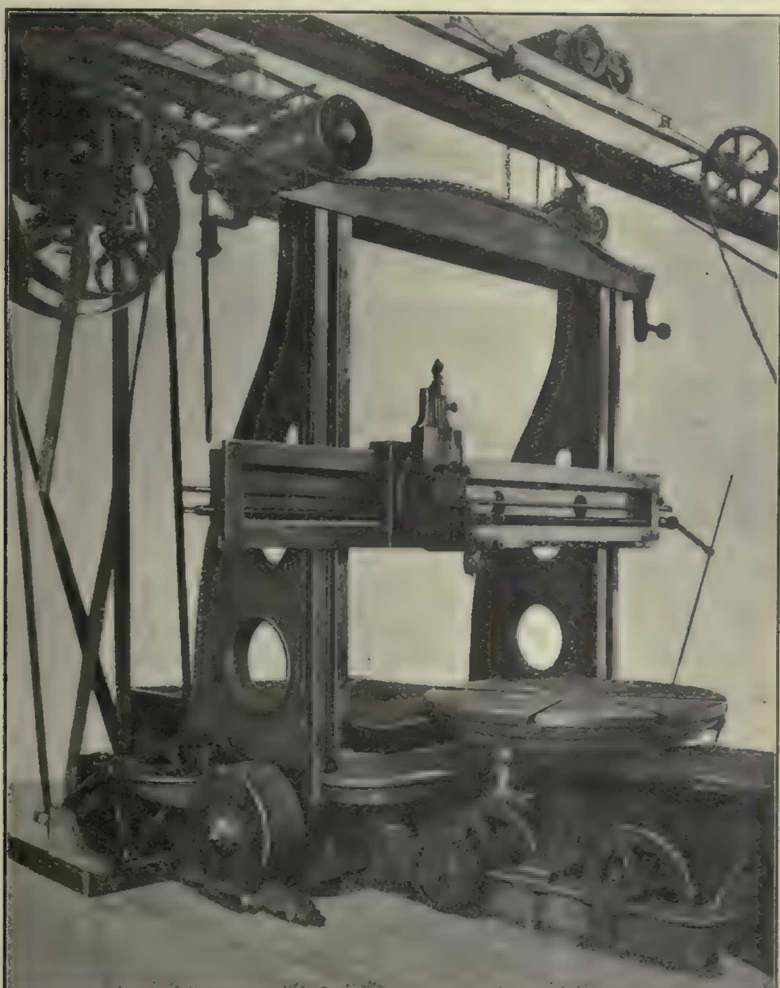


Fig. 1.—Planer, Showing Boring Mill Attachment.

The construction of the table and bed Fig. 4 is like that used in most Boring Mills, i.e., a V on the lower side of the table travelling in a V-groove in the bed piece, with a central stud with washer and nut on its lower end. The V's were carefully machined to templates, and scraped and ground. The bottom half of the Boring Mill bed is fitted to the ways of the planer bed, and connected to the planer standards by a cast iron knee on each side. These knees are planed on the face that are fitted to the standard and have chipping strips where they joined the Boring Mill.

After fitting the space between the chipping strips were filled with babbitt making a solid joint. The Boring Mill is not bolted down to the planer bed. The driving gear is shown in Fig. 6. The 4 inch bull wheel shaft is bored 6 inch deep and a 2 3-16 shaft driven in and pinned with ⅜ dowells. The holes

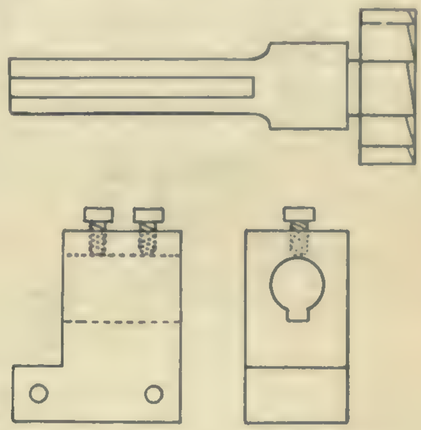


Fig. 2.—Milling Tool and Holder.

were drilled off center leaving ⅓ the diameter of the dowel in the 2 3-16 in. shaft to prevent shearing. On the outer end of shaft is a driving gear B.

The second shaft has a step bearing bolted to the planer bed and carries a spur gear and bevel gear.

Keyed on the bevel gear and a spur pinion shown in Fig. 4 are on a vertical shaft. The spur pinion drives the table through the internal ring. This ring bolted to the table with ⅞ cap screws, spaced 8 in. centers. This gear drive and frame are on a concrete foundation and the frame is bolted to the side of planer bed.

As shown in Fig. 6, it is a double drive the right hand drive, as shown,

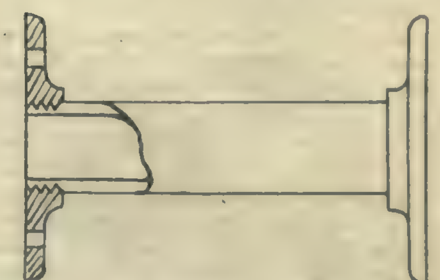


Fig. 3.—Extension Attachment.

is used when on work over 84 in. diameter. The boring mill is moved back on the planer bed in line with the shaft on the right and the drive is through the two bevel pinions and so

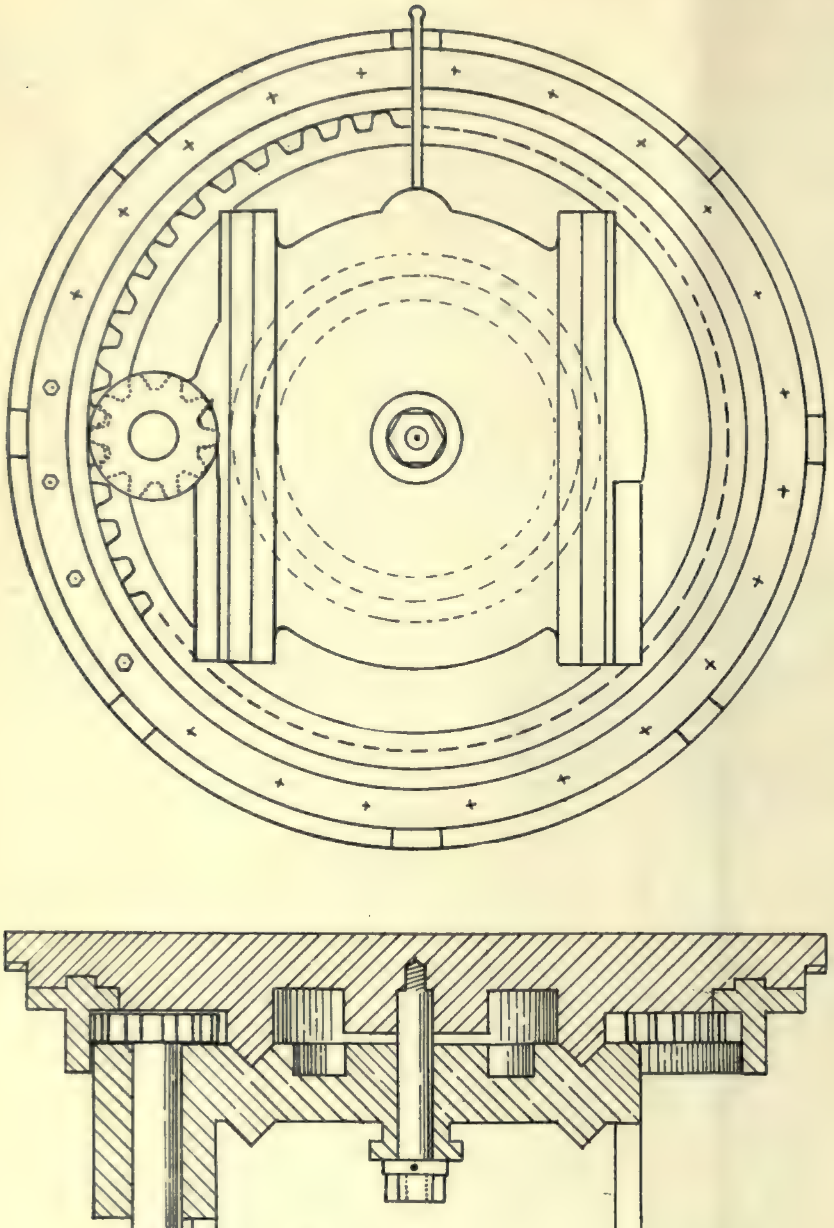


Fig. 4.—Boring Table.

valve pumps. Fig. 2 shows the tool and holder used for the latter work. The holder fits the head in place of the clipper block and is held solid with 2 taper pins. The work is centred on the table and the tool fed to the depth required.

A 9 ft. 5 in. fly wheel of 2½ tons weight was machined in this mill. This wheel had considerable over hang and chattered somewhat until the gear drive was helped out by a rope drive taken from a nearby Radial using a 24 in. sheave on an arbor in its spindle and running direct on the rim of the fly wheel. To bore this wheel an extension head Fig. 3 was made of a piece of 8 inch W. I. pipe and 2 flanges. The flanges were threaded, shrink or faced to length and drilled to suit the head. The head was put on the outer end of the extension with the holder Fig. 2 in place of clapper block. This holder is bored for a 3 in. bar making it a very stiff tool and allowing the use of the bars and toolholders of a 42 inch Bullard mill which is part of the shop equipment. These jobs are handled on the combination machine in better time than in the lathe. There are four changes of gear shown in Fig. 6, which handle a wide range of different diameter of work and keep the cutting speed nearly right. The gears are 3 pitch 3 in. face. The cost of the attachment was under $300, and the time required to set up or change from planer to Boring Mill is less than two hours.

J. E. Ruby, manager of Frost & Wood, Winnipeg, has been transferred to the head office at Smith's Falls, Ont., where he will have charge of the sales department.

to the ring. The tools used are the same as used in planer work and used in the planer head on the cross rail. The cross and down feed is transmitted through the two screws in the rail, from a ratchet wrench attached to the square on the end of the screw. On the outer end of the ratchet is a swivel stud through which passes a ½ inch round rod held by a set screw, and connected to a cross shaft with a finger or bell crank on each end. This shaft is carried in two bearings on one of the cast iron knees, connecting the boring mill to planer standard. The fingers which operate the bell crank are CRS cut to length and set in the slots of the table To increase the feed, increase the fingers.

Besides the work for which this machine was built it has been used to face large centrifugal pump shells and for counterboring for the covers of the valve chambers of large duplex pot

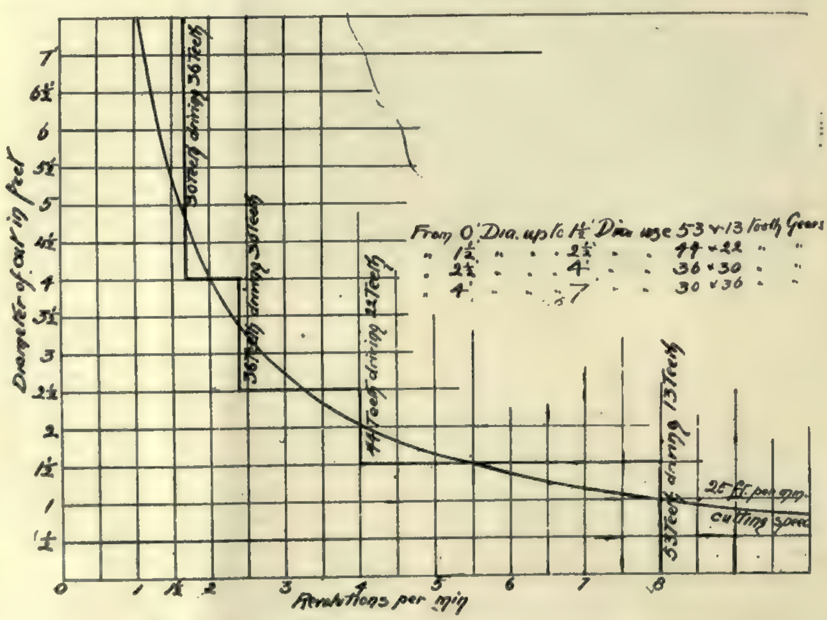


Fig. 5.—Change Gears for the Combinat ion Machine.

ADVICE TO YOUNG MEN.

By J. M. Mackie.

While this is unquestionably an age of large corporations, I firmly believe it would be better for the future prosperity of Canada if more encouragement were given to the young men of this country to start manufacturing some one special machine in a small way. The press is continually heralding the advent of big enterprises, and our young men are inclined to forget that the great majority of our large enterprises had very small beginnings.

The manufacturing of power house equipment in Canada during the past ten or fifteen years has been very discouraging to the Canadian manufacturer for various reasons, some of the causes have been beyond the control of the manufacturer, but other causes of unsatisfactory results have been overlooked in the burning desire to be big and great.

The method adopted to achieve greatness in the iron trade in Canada has been by manufacturing a large line of various machines, instead of specializing and concentrating all energy in the development of some particular line.

I think I am safe in claiming that no branch of manufacturing has gone through such a complete revolution in the past twenty years, and is now specialized to such an extent as the manufacturing of machinery.

Twenty years ago the purchaser of an engine would visit a machine shop and tell the proprietor the kind of engine he wanted and every detail would be made on the premises, even the bolts and nuts were forged by hand and finished in the shop. To-day an engine is often shipped the day it is ordered, and the average manufacturer only builds one type of engine, which is of his standard design and will not be changed to suit the whims of every purchaser.

The evolution in methods of manufacturing machinery has been perhaps as complete in Canada as in other countries, but the mistake being made to-day by most Canadian manufacturers is in attempting too much.

In the old days a manufacturer prided himself in being able to build any kind of a machine, and our machine shops have not felt disposed to drop the manufacture of any of their various lines, but have tried to specialize them all. Perhaps our northern climate has made us over ambitious, the result is that we have not specialized any one particular line to the greatest possible extent, and our neighbors across the line were able to ship into Canada last year several million dollars' worth of machines which could have been manufactured in Canada. Our imports of machinery will continue to grow until we specialize more thoroughly.

Let no young man shrink from commencing to manufacture in Canada in a small way any machine which he knows to be equal to the best, and for which there is a good demand, because by persevering in one line, special knowledge will be acquired and will bring special results, and the small industries of today will become large enterprises in the future of Canada.

If a man works for a living—that's all he gets. The fellow who reaps the prizes is the fellow who enjoys his work and is sorry when it's time to quit.

Not the biggest brain, but the best trained mind most surely brings success. The lamp in the headlight isn't any larger than many other lamps, but its light is trained where it is most needed.

The man who loves his work, who glories in it, is bound to succeeed. You can't hold him down.

Enthusiasm is the power that drives our mental machinery. It is the force that brings things to pass Lack of it may be the one thing that holds you back from the fullest success in life.

No man can be a success in a position unless he is in love with his work, unless his best thought is devoted to it, unless he finds pleasure in doing it and doing it well.

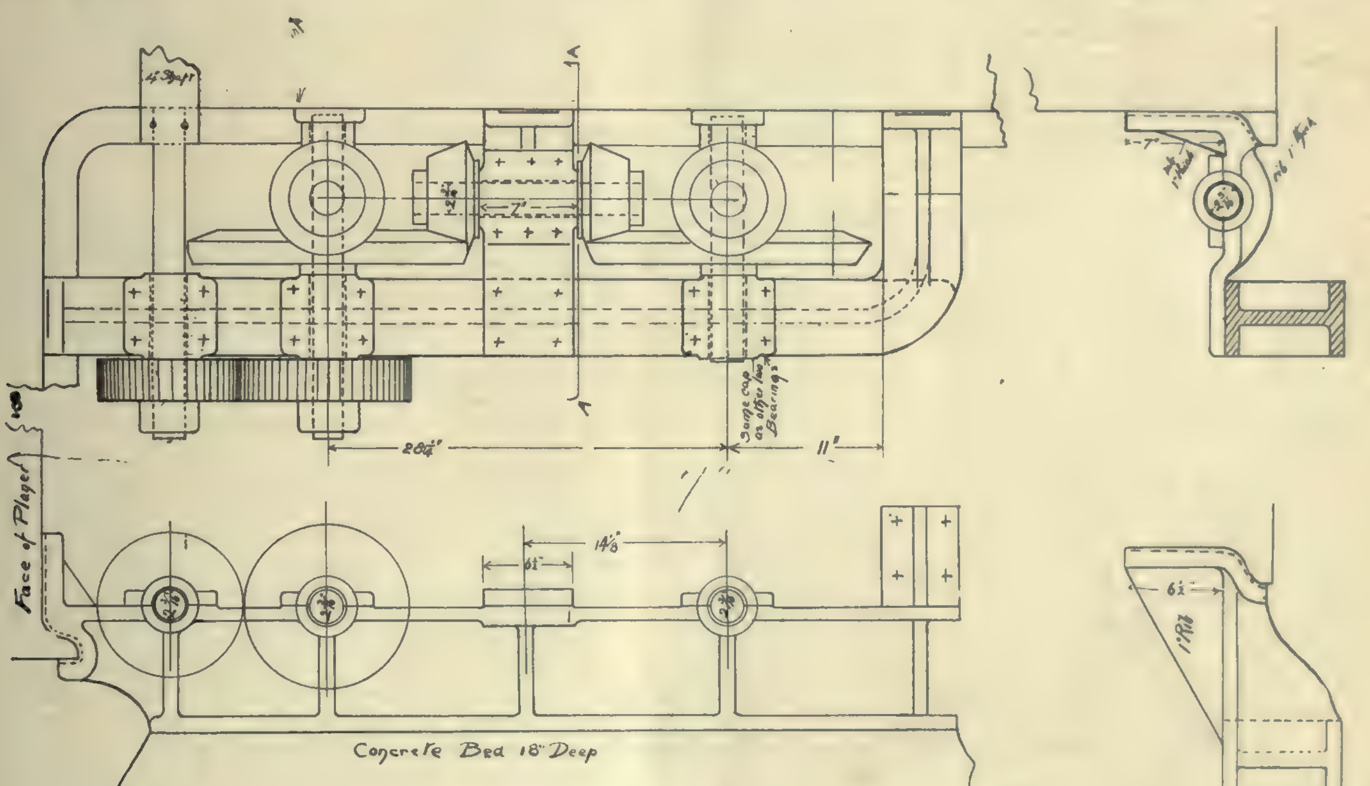


Fig. 6.—Boring Mill Driving Gear.

Tools and Methods Used in Forming Irregular Work

Machinery Pieces of Irregular Outline—Tools used on Various Machines, Turrets, Milling Machines, Etc. — Methods of Producing the Tools.

By JOHN EDGAR.

With the increase in the facilities for the production of work of irregular outline, this class of work has become more common. The increased rigidity of the lathe and the rapid introduction of the turret lathe have made it possible to produce turned work of this character at a cost almost as cheap as that of regular cylindrical shapes, while the use of the milling machine makes it possible to produce flat work of an irregular cross section with comparative ease when supplied with proper cutters.

Some of the methods employed both in the use of and the production of the formed tools and cutters may prove of interest.

Form tools owing to the nature of the cut, being generally quite broad, their support must be very rigid and devoid of all vibration. The whole success of the process depends to a great degree on the means of support. For this reason attempts that have been made in the past on the engine lathes of older design have been invariably a dismal failure and have, in all cases except those of dire necessity, been abandoned. Not only must the tool be supported well, but so must the work be supported close to the cut. So much trouble had been experienced in forming this class of work that the hand tool was invariably used, if not in roughing out the shape to finish it. Now the tools are held so securely that it is a complicated form that requires a roughing and finishing cut, one tool being used from start to finish and produces work that requires but the touch of emery cloth to bring it up to a bright finish. Chalter marks are conspicuous by their absence.

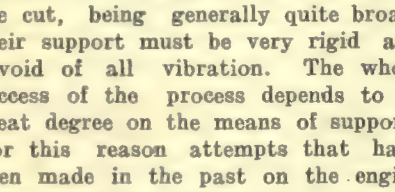


Fig. 1.—Form Tool for Machine Handle.

An Example of Formed Lathe Work.

Fig. 1 shows a familiar example of formed lathe work, the machine handle. The tool shown is as used in a turret lathe which performs the operation automatically working on bar stock. The operations are as follows: The end is faced and the cylindrical part turned to the shoulder, this done the turning tral gives place to a roller steady rest that supports the end during the forming operation, which is next in order. The absence of vibration in this machine allows the chip from the forming operation to continue in one piece until it either breaks of its own weight, or by catching in some obstruction. This must also be accredited to some extent to having the forming tool cutting edge ground and set with a proper cutting rake.

Instead of the old style forming tool with shank held in the tool post of the lathe, we now have the tool held in a dovetailed recess in a massive block which is securely bolted to the slide. This method of holding the tool is shown in Fig. 2. The face of the block in which the dovetail is planed has an angle of about 5 degrees with the vertical and the cutting edge of the tool has a top rake of 3 degrees with the horizontal or 82 degrees with the face. This cutting rake is right for the general run of work, but may require altering for work on hard stock, when the tool may be made with little or no rake. A tool of the design shown has longer life as well as being more rigid. When the form is very irregular and where the tool cuts near the center of the work in some places, it will be best to have the top face of the form tool flat, with out rake, as the difference in the diameter of the form would cause the cutter to drag or scrape the metal on the outer diameter, because it would then be below the center, instead of having a good cutting action. However when the shape of the work will allow, the angle of rake given above should be used. In cases where the reproduction of the form must be accurate the top rake must be zero unless the form is made to counteract the difference caused by the angle of top face. This feature will be taken up in connection with the making of the tools.

In hand turret lathes which work from the bar, the forming tool holder is generally of a special design peculiar to the difficult makes. In some machines provision is made for two form tools, one roughing and the other finishing, both working at the same time. The roughing tool is generally made with stepped cutting edge tending to break up the chip reducing the power required and also the strain on the work and machine. In cases where the cut is of great length the above method

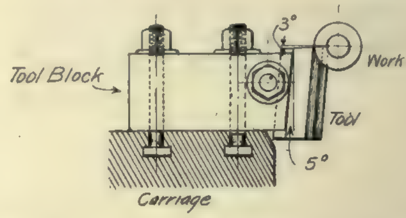


Fig. 2.—Form Tool Holder for Lathe.

is to be recommended. A cut like that shown in Fig. 1 would impose more heavy pressure on the tool and work than one in which the outline was more irregular with sharp corners, because the chip would be more broken up and divided into strips than in the example shown.

Tool for Small Automatic and Milling Machines.

For use in small automatic machines and for heavier work of short length the circular form tool shown in Fig. 3 is made. This tool is set with the center above the center of the work and the cutting edge on the center of the latter so as to provide for clearance. As the cutting edge wears and is reground the tool is revolved on the shank to bring the cutting edge again to the proper level.

The cutter used in the milling machine for producing formed work, may be one of two kinds; either with formed relieved teeth or with formed milled teeth. The former being ground on the front face of the teeth and with out changing the form while the latter must be sharpened by grinding on the periphery, the wheel following the form and reproducing it. The former is the one most commonly used and is to be perferred, but in many classes of work the latter with milled teeth is much used, namely in gun-shop and arsenal work.

Making Form Tools.

The methods of producing the formed profile of the tool will now be described. The process of producing the form tool will depend to a great extent on the

use to which the tool is to be put and to the accuracy with which the desired form is to be reproduced. Thus in the case of form tools for making tap or reamer cutters it is not necessary to use as much pains in making the form exactly to the sketch as would be the case in making the tools for gear cutters, which must produce gears that

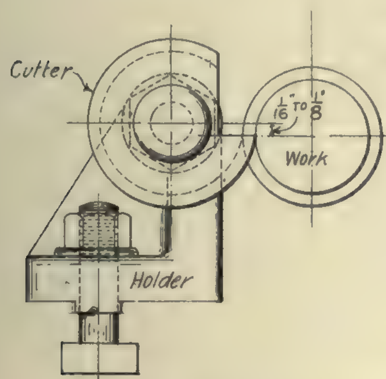


Fig. 3.—Circular Form Tool and Holder.

will run smoothly without noise. In one case we are making tools to remove superfluous metal, the exact profile of cut being just as well suitable for the purpose with slight variations as when made precisely like the sketch or model, but in the other case any variation from the sketch or layout would be a source of trouble that must be avoided by accuracy of reproduction.

As an example, let it be required to make tools for forming the milling cutters used in fluting taps like Fig. 4. A lay out of the form is made on thin sheet zinc or brass. In order to make the lines show up more distinctly the sheet metal is first given a thin coat of etching varnish which leaves a black surface upon which the lines are scratched with a sharp scriber. A template should be then filed out the exact shape that the cutter is to have as shown in Fig. 4 by the dotted lines. In making templates it is best to have the sides or at least one side square with the cutting edge, so that it may be set and tested by a square or straight edge. Thus in Fig. 4 the template is made wider than the desired form by a considerable amount in order to have edges at a convenient location from which the squareness of the form may be tested. This will become evident as the article proceeds.

Now proceed to make the planing tool. This tool is used in planing the form tool used to form the cutter. This tool may be made to fit the tool block of the shaper or planer, or it may be used in the fly cutter holder shown in Fig. 5 and used on the milling machine. In the latter case it is used as a milling cutter and is then termed a fly tool or cutter. This is a master tool and is reserved for making form tools when new ones are required.

This planing tool is generally made of stock $\frac{1}{8}$ or $\frac{1}{4}$ of an inch thick and as wide as the form requires, and about $3\frac{1}{2}$ or 4 inches long. It is planed on all sides square and either provided with a shank or with suitable holes drilled in it as means for holding it in position when in use. These tools should be made of well annealed tool steel.

The end of the tool which is to be formed is now given a coat of copper upon the top face by applying a solution of sulphuric acid. Remembering that this tool is to have the same shape as the cutter, scratch the outline of the form, using the template as a guide, getting the form transferred square with the sides of the tool.

The block of steel is now set up in the shaper so that the end may be planed with a clearance of fifteen or twenty degrees. Then with the tool so set follow the outline of the form as closely as possible without touching or running into the lines.

Having blocked out the form roughly it is now necessary to file it to the shape desired. The tool may be held in the vise during this filing operation, or may be clamped to the bench in the horizontal position, whichever the workman finds more convenient. The filing should be done with the cutting stroke away from the cutting edge as this not only leaves the lines visible, but also throws the burr on the under side of the tool. Care should also be taken so that the clearance is kept constant and frequent trials with the template be made as the form nears completion. The easiest way in which the template can be compared with the outline of the tool is by holding up to the light and noting where the contact of template and tool exclude the light. These places are obviously the high spots and must be filed away. Too much should not be taken off any spot without again comparing with the template, as daylight can be seen through very small spaces and the effect on the eye is that of a wide space, especially when the light is bright and concentrated as in holding the work up to an artificial light or bright sunlight.

After the form has been produced in the planing tool to the degree of accuracy desired the latter is hardened and tempered. It should be drawn to a light straw color in temper. If made too hard the edge is apt to crumble away or chip. After tempering, the edge should be brought up keen with a stone. Oil stone chips are used in stoning and the best results are obtained when kerosene oil is used as a lubricant. The heavy machine oils are poor lubricants for stones as they fill up the pores. Stones that do not cut freely because of this gumming up may be restored to good condition by soaking in kerosene. Some toolmakers use naptha or gasoline for this purpose, but owing to their low temperature of ignition and their tendency to evaporate quickly, are not to be recommended. If a surface grinder is handy the top of the tool and also the bottom should be ground off straight before stoning the edge. This tool should be sharpened when worn by grinding across the top.

Making the Form Tool.

Having finished the planing tool the form tool may now be made. Tools used in relieving formed milling cutters must have a greater angle of relief than for ordinary work. This is on account of the peculiar process that is used in forming the relief of the tooth. This is generally done by causing the form tool to dig into the cutter blank as each tooth passes. An angle of twenty degrees may be considered sufficient as clearance for tools of this class.

The face of the form tool may now be planed. If the tool is to be held in the tool post of the lathe as an ordinary tool it must be planed with the desired angle of clearance on the end, but if held in the holder shown in Fig. 2 it is planed parallel with the back, the clearance angle being provided in the holder. The form tool after being given

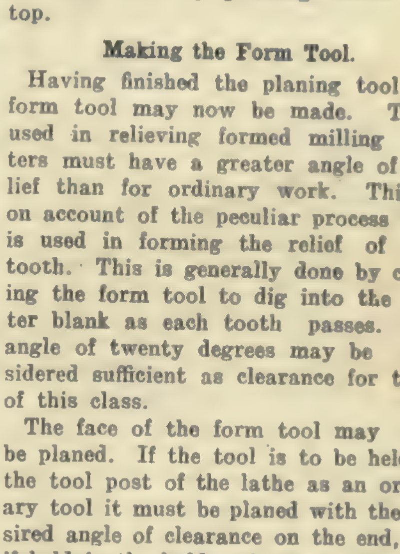


Fig. 4.—Tap Section, Template and Tool Layout.

the form required is hardened and tempered and ground ready for use.

In order that the form produced by the form tool may be a duplicate of the sample or template, the section through the form tool on which the template matches must lie in a plane through the axis of the work, or must

be perpendicular to the direction of travel of the tool in planing or milling. If it lies in any other plane the cutter does not reproduce its own form.

Fig. 6 shows the difference in form. In the case just treated the error is so little that it may be overlooked, but in cases where it is desired to reproduce the exact form, correction for this error must be made. There are differ-

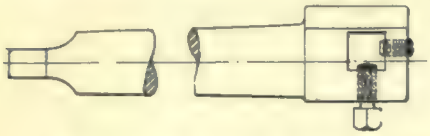


Fig. 5.—Fly Tool Holder.

ent ways of doing this. We may, if the form is not too complicated, project the correct shape from one plane to another at an angle with it, equal to that of the clearance, giving the shape for the planing tool. This method is one that requires care and skill in drafting. A simpler method would be to hold the template, in filing the planing tool, at an angle to the top face equal to the clearance angle of the form tool as shown by the heavy line in Fig. 6 at (a). In filing a tool with the template held in this manner care must be taken that the form is parallel from top to bottom of tool. The error exists also in the case of the circular cutter shown in Fig. 3, as the cutting edge is off the centre of the cutter and reproduces a form on that line. The turning tool used in forming this cutter may be treated in the same manner as the planing tool above.

In reproducing a form of symmetrical shape it may be best where it is desired to be exact to make a master tool of but one half of the form, and with this plane out the planing tool. In this case the master tool would be filed and fitted to a template of the shape on one side of the symmetrical centre and projecting a slight amount on the other side for purposes of gauging the cut. The planing tool would be roughed out approximately to shape and one-half of the form planed in to the required depth. The planing tool would be reversed in the vise and the other half planed. To facilitate matters in obtaining proper depth for the second half of the cut, the first half may be given a coat of copper which when scraped by the master tool in the second operation, would indicate that the proper depth had been reached.

In gauging the proper width of the form we may resort to several methods, any of which have advantages depending on the particular case in hand. First, we may scribe the line of symmetry on both the master tool and upon the piece we are planing and by matching the lines we may locate the tools. Some forms may lend themselves to easy measurement, in which case it should be done as a means of checking the results.

Long and Irregular Forms.

We can easily imagine forms that would be difficult to file to shape on account of their length and irregularity of form. The method of procedure in such a case would be to make several master planing tools of short length, each having a section of the form to plane. Each tool should in this case overlap the portion that the adjacent tool planes by a small amount, serving as a gauge as in the cast of the symmetrical form discussed above.

Another method of gauging the depth of the cut may be added to the methods already mentioned. This method is that of measuring the distance from the top of the table or vise to the cutting edge of the tool by means of a jack or block. The position of one tool is taken after it has reached the depth and the depth of the next in order brought to the proper depth by gauging to the corresponding part of the form.

In the above the operations have been mentioned as planing operations. This has been to avoid confusion of terms, and what has been mentioned as to planing may be equally well said of milling. The tool spoken of as the planing tool then becoming a fly tool

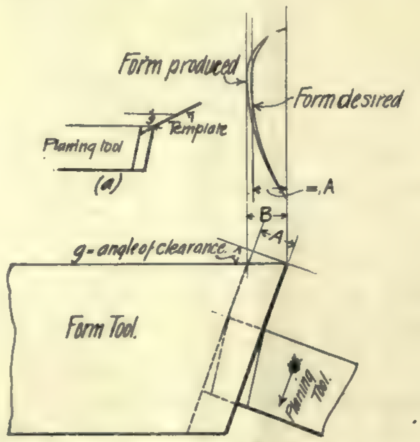


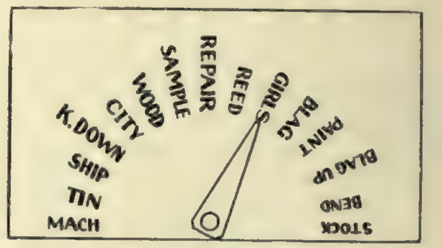
Fig. 6.—Error in Form Due to Clearance Angle.

used in the holder, Fig. 5. The milling machine lends itself to this class of work on account of its easy handling and accurate movements, though as good work can be done on the shaper. Had the above operations been performed in the miller many toolmakers would lock the spindle of the machine against rotation and plane the form already milled by taking one or two very light chips, moving the table by hand. This removes any waviness that may be in the surface due to the holder running out of true or of springing. In this operation caution must be taken in having the fly tool set properly, at right angles with the table top, in order to preserve the form.

In laying out form tools it is a good idea to provide a gauge point from which measurements may be made. This is shown in Fig. 4 at (d), where the form tool is made to project past the formed edge or facing, off the side of the cutter for a distance of a quarter of an inch. The cutter is then faced across the side flush with this small strip and forms a means by which all cutters are made duplicates in relation to this side of the cutter. For setting the cutter in fluting taps measurement is taken from this side to the periphery of the tap, parallel with the top of the table. This is a point that one is liable to overlook unless it has been impressed on one's mind by previous experience.

TRANSFER CARDS.

In the Gendron Mfg. Co., Toronto, the elevator man does most of the transferring from one flat to another. He devised a scheme to facilitate the quick transportation of material. When a truck is loaded in one department it is taken to the elevator. At the side of the elevator are hanging a number of tin plates, painted white, with the



Transfer Card.

names of the various departments printed on them. One of these plates is shown in the illustration.

A workman hangs one of these transfer cards on the truck turning the arrow to the name of the department to which it is to delivered. The elevator man looks at the card, hangs it on the nail so it may be used again and takes the truck to the proper department. This scheme is found to greatly facilitate the handling of loads of material and besides saves the time of the workmen.

James Alexander Young, well known in Montreal machinery trade, died suddenly at his residence in St. Urbain Street, Montreal. He was 51 years of age and a native of Montreal. Joining his father in the engineering and machinery business, he succeeded him as proprietor and manager.

Accurate Cost Keeping as an Aid in Manufacturing

Second Article of a Series on Cost Keeping, Describing the Time Keeping System in Use at the Works of the Canadian Locomotive Co., Kingston.

One of the duties of the timekeeper is to note and register the time each workman enters and leaves the shop. At the Canadian Locomotive Works the opening hour is seven and the closing hour is six, with one hour at noon. The working time is, therefore, ten hours.

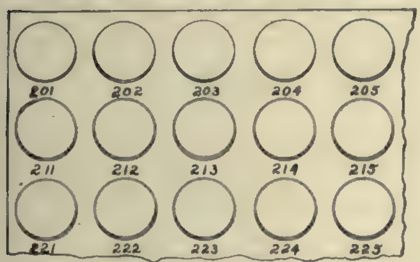


Fig. 1.—Check Board.

The following method is followed for keeping the time of employes. Boards one inch in thickness and two feet long by eighteen inches wide are prepared in the following manner: Holes of 1½-inch diameter are bored to the depth of ⅛-inch. About ¼-inch is left between the holes at the side and ¾-inch between the top of and the bottom of the next. At the bottom of the hole a slight cutting is taken out by means of a chisel. This allows the check to be easily removed. Numbers are printed beneath the holes. The checks are made a little smaller than the holes and of brass, bearing corresponding numbers, and are inserted in the holes above their numbers. These check boards when not in use may be arranged in a cabinet. Before starting time the timekeeper arranges them on a long table in front of his wicket. If it is a small shop an ordinary table will serve the purpose. As the workmen enter in the morning or at noon each man is given a number which is his during his stay with the firm.

Fig. 2.—Check.

Nov. 1/06							
ABSENT		LATE		ABSENT		LATE	
A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.
201	201	203-7½	251-1½				
253	253	251-7½					

Fig. 3.—Absent and Late Record.

CANADIAN LOCOMOTIVE CO. (LIMITED)

No. ______ DAILY TIME CARD FOR PREMIUM WORKERS ONLY

Mr. ______ ______ *190*

PREMIUM WORK

FOR		MACHINE	HOURS

DAY WORK

.... *Foreman.*

Fig. 5.—Daily Time Card.

SHOP STATEMENT Nov. 1 1906									
CHECK No.	HOURS WORKED	RATE	TOTAL		CHECK No.	HOURS WORKED	RATE	TOTAL	
200	10	22½	2	25	250	10	12½	1	25
201	—	—			251	9½	12	1	14
202	10	21½	2	15	252	10	16	1	60
203	9¾	20	1	95	253	—	—		

Fig. 4.—Shop Statement.

When the man goes out again at twelve or six he drops his check into a box prepared for the purpose. This box has a hole in the top just large enough to admit one check. Fig. 1 shows a view of the board, and Fig. 2 illustrates a brass check.

Before twelve and six o'clock the board is "called off" by the timekeeper's assistant and the numbers of the men absent are noted. If a workman leaves before twelve or six he must produce an order from the foreman.

CANADIAN LOCOMOTIVE COMPANY (Limited). Form 1

TIME CARD.

MAN'S No.	NAME	DATE
CHARGED TO	DESCRIPTION OF WORK	HOURS
ORDER		
		RATE
OPERATION		
		AMOUNT
DRAWING		

Fig. 6.—Work Slip.

The timekeeper then takes the check and marks down the hour of his departure.

If a workman is late, a record is made as in Fig. 3, and if he leaves the works before twelve it is entered on this sheet. A shop statement is made up each day and checked with the absent and late list. Fig. 4 is a shop statement showing 201 absent as indicated in the absent record. No. 203 was late, and is therefore entered in the shop statement as working 9½ hours.

DAILY DISTRIBUTION OF WORK									
612		613		614		615		616	
1	15	1	14		67	3	25		
1	16		67		68	2	26		
1	10	1	10	1	10	2	00		
1	10	2	10	3	00	2	25		

Fig. 7. — Distribution of Work on Contracts.

Fig. 5 is the daily time card and is filled out by the men themselves. These are collected by the timekeepers between five and six o'clock, and from these the card shown in Fig. 6 is made out. The card shown in Fig. 6 is about 3x6 inches, and one entry is made on each slip.

The amounts on each man's slips are added together and correspond with the total amount of the shop statement. In the place for operation, (F) is put for fitting, (P) for planing, (D) for drilling, (T) for turning, etc.

Fig. 7 shows a statement with charges made according to contracts. The slips shown in Fig. 6 are arranged according to contract and the amount is entered on this sheet. Fig. 8 is the labor summary card made out each day by the timekeeper.

LABOR SUMMARY DATE Mar. 1/05						
	NET		CHG %		TOTAL	
Contract 612						
" 613						
" 614						
" 616						
"						
"						
Repair order A 108						
" " A 109						
" "						
" "						
Stock						
Staff Salaries						

Fig. 8.—Labor Summary.

In the March issue will be described the paying system, and in April the material cost and labor summary.

Recent Developments in Technical Education in Canada*

Conditions that Exist in some Shops and How They May Be Eliminated—Technical Education in Nova Scotia — Comments by F. H. Sexton, Director of Technical Education in Nova Scotia—Circulating Technical Libraries in Ontario.

Young mechanics find it difficult at first to master the reading of blue prints and as it is important that he should understand them he is sometimes met with the refusal of work. One day one young machinist in a shop received a reprimand from his foreman because he could not read a working drawing with sufficient skill to do his daily work properly. He enrolled in the mechanical drawing course in an evening drawing school, thinking this course would meet his deficiency. He found that the first two lessons were concerned with lettering plates, the next three with drawing straight and curved lines and the handling of instruments, and that the remainder of the term was spent on the projection of points, lines, surfaces and solids. During all this time he was receiving in his daily work the same reprimands, and was therefore debating in his own mind the value of the drawing course. It is undoubtedly true that the drawing course this teacher had outlined in the drawing school is a proper one for teaching mechanical drawing for those who are to be draftsmen, but the average apprentice machinist, as well as this young man, does not see the direct application of this instruction to his work. He enrolled in the drawing school for a definite purpose. To be sure it was a narrow one, but nevertheless it had economic value to him.

The principal of the St. Lawrence, Mass., Industrial School overcame this difficulty by establishing in that school a course in blue print reading and arithemetic for machinists. The first lesson begins with some elementary instruction in the reading of simple drawings ; to teach him in five lessons where to look for the dimensions denoting length, breadth, and thickness; to show him the principles of simple sectional drawings and have him comprehend the laying out of holes for drilling. Instead of leaving school at the fifth lesson with no instruction which appealed to him, the students have received enough in those five lessons to fit them to meet the needs of their foreman, and are anxious to continue and receive the more definite and thorough instruction in the theory of mechanical drawing so as to be able to make sketches of machines and parts by means of a ruler and compass. It is not the aim of this course to teach the students to make pretty picture drawings.

The instruction in the various branches of mathematics is adapted to meet the needs of the mill operative, the machinist and the steam engineer. The terms used in the class room savor of the shop and mill. All the students are classed according to their trade. Evening and day classes are held and subjects are arranged and taught to appeal to the different classes. Thus the application of mathematics for the engineer is different from that for members of other trades.

Technical Education in Nova Scotia.

The Department of Technical Education in Nova Scotia is under the direction of Frederick H. Sexton. He has instituted the system of evening technical schools. There has been constructed also the Nova Scotia Technical College at Halifax. One building contains the lecture rooms, assembly hall, scientific laboratories, Provincial Science Library, the Provincial Museum, and administration offices. The workshops, power and heating station, hydraulic laboratory, mining, and metallurgical laboratory and mechanical and electrical engineering laboratory will be in buildings of factory type, separate from the main college building.

Two-year courses consisting of general mathematics, science, language, drawing workshop, etc., will be carried out in Nova Scotia's four colleges and

* In March, 1908, appeared the G.T.R. Apprenticeship System : November, 1908, Industrial Course at Fitchburg : December, 1908, Urgent Necessity for Technical Education in Canada : January, 1909, Co-operative Technical Education with Examples.

in Mount Allison University, N.B. The last two years will be taken at the Technical College. Short courses will be provided in mining for colliery managers, in civil engineering for road inspectors, in mechanical engineering for firemen and steam engineers, etc. These short courses are necessary, in order to serve the province with the educational needs that are so apparent in the industrial circles.

In establishing a system of technical education, the government in Nova Scotia realized that they had to provide for both the youths that were about to become wage-earners and also those who were already engaged in the industries. They therefore provided a system of evening schools.

In the large centers engineering schools are maintained, firemen engineers, and mechanics are instructed in the elementary scientific principles and modern practice in steam and mechanical engineering. Classes in mechanical drawing, machine drawing, electricity and dynamo-electric laboratory have been established in connection with the engineering schools, and have been very well patronized. To make the teaching in this subject effective, considerable electrical apparatus and a number of motors, dynamos, etc., were purchased and a laboratory started in each place so that the men may work with the actual machines, in addition to classroom work.

The coal mining schools aim to instruct miners in the science and art and modern practice in this difficult branch of industry. There is an evening school in practically every colliery town in Nova Scotia—some twenty in all. Day classes are held in the larger towns for men who work on night shift. The teachers, with the exception of a few assistants, are men who are best fitted by training and long practical experience to act as instructors.

Evening technical schools have been established in the various larger manufacturing centres. There are at present four of these, viz., Halifax, Amherst, New Glasgow, and Sydney. In each place they are conducted in the public school buildings. The Provincial Government bears practically all the expense of the coal mining and engineering schools, but in the evening technical schools provides one-half the cost of instruction and furnishes the necessary apparatus, while the locality is required to supply the other half of the cost of instruction, besides the rooms, heat. light and janitor attendance.

Courses are given to teach the men in different vocations the drawing, science and modern practice connected with those vocations. The courses in any locality depend on the number of students available and the dominant industries. There are some classes, such as Practical Mathematics, Mechanical Drawing, and Electricity, etc., that are demanded in every centre, and then there are others, such as Metallurgical, Chemistry, Pharmacy, etc., that are dependent on the size of the locality and the special industries.

The Need of a National System.

Mr. Sexton speaking at the Canadian Club in Toronto, said that the factory system was the outgrowth of modern thought, that it was a process of evolution. It had come to stay, and the best way was to adapt the school system to it. The modern factories want leaders, foremen in their work. Almost all manufacturers say that it is almost impossible to recruit foremen from the ranks. One very prominent manufacturer said that he would have to shut down his shop if his foreman "quit," as he had not a man in the place capable of taking his place. That was the difficulty with the differentiation taking place in trades.

These men were boys who left school at 14 years of age, ill-equipped for the great work before them. They could no longer learn all of a trade, but just one part of it, and all-round men, capable of taking any place were sadly lacking.

The German system was commenced about 40 years ago. Germany has meagre resources, but the leaders figured that the people were an asset and began developing the people, and did not pay so much attention to the resources of the country. In Canada there is danger of developing the resources only and letting the people go. In Germany all the children go to the same schools, the common schools, until 10 years of age. If they desire after that age to go into the professions, they go to a classical school, and so on. But there are trade schools for the boy who wishes to learn a trade—for the boys of the poor man who must earn their living. Here they attend for some time. Then there are what are termed part-time schools. If a boy is working at a trade in order to earn his living, he must attend these part-time schools, where he receives the same rate of wage as he does when engaged in the factory. Then there is an indefinite number of evening schools, and also on Sunday. These Sunday schools are opened with a religious service, and the boy is taught something useful. Munich alone had 40 trade schools, where 40 different trades were taught. The system, declared the speaker, had raised the thrift, the industrial education and the capacity of all German tradesmen above all others.

Developments in Ontario.

A departure along the lines of technical training and practical science for adult artisans has been decided upon by the Education Department. The initial steps have been arranged, and the necessary legislation for the carrying out of the project will be introduced by Hon. Dr. Pyne, Minister of Education, at the next legislative session.

A league of libraries in industrial centres will be formed. Each library will be required to expend not less than $100 per annum for the purpose of purchasing text-books covering the principal trades represented in the workshops and factories in the town. To such libraries the Education Department will loan, through travelling libraries, technological books to the value of $100. Care will be taken to prevent the duplication of books. The textbooks will be loaned to any mechanic without charge, and it is expected that arrangements will be made for holding examinations in the local libraries at stated intervals. Mechanics who complete the course of reading and pass the examinations will be given certificates.

The examinations will probably be held under the control either of the Department of Education. Mr. T. W. H. Leavitt, Provincial Inspector of Public Libraries, has been in communication with several manufacturers and employers of skilled labor, and they are enthusiastic over the project.

Business Course for Engineers.

McGill University has added another course to its curriculum dealing with the business aspect of engineering.

Among the other subjects treated of will be the relation of engineering to business, money and credit as applied to engineering business, the operating and business organization of companies, the purchase and sale of engineering material. accounting and bookkeeping in engineering works; specifications: contracts and reports; estimates, valuations, etc. The course of lectures is to be given by Robert A. Ross, E.E., of Ross & Holgate, Montreal.

AN ARTIFICIAL GRINDSTONE.

A new method of grinding glass is used by the Onward Manufacturing Co., Berlin, Ont. This discovery is a grindstone made from one-half best portland cement and one-half silica sand, the ingredients being thoroughly mixed and tamped even. When properly made the stone has no hard and soft spots, and it will grind glass without scratching. The cost is about 10 per cent. of the common grindstone. The new stone has been used successfully for one year and found to be superior to natural stone.

PRACTICAL ARTICLES BY OUR READERS

Readers are Invited to Contribute to this Department with Short Articles or Comments — We Pay for all Available Material.

POWER PRESS CLUTCH.

By J. H. R., Hamilton.

Fig. 1 shows the clutch assembled on the crank shaft with the fly-wheel in position.

Fig. 2 shows the position of the clutch pin P when the ram is in a raised position or at the highest point of the stroke. By lowering the treadle rod and the lever L. is also lowered, thus removing the dog D. from contact with clutch pin P, the spring S forces the clutch pin to revolve to the position shown in Fig. 3, thus bringing the edge E of the clutch pin in contact with one of the faces of the groove in the clutch bush B. thereby revolving the crank shaft. By releasing the treadle and the lever L is raised by a spring (not shown) causing the dog D to ride on the circumference of the hub H. until it comes in contact with clutch pin P forcing P. back to the position shown in Fig. 2, allowing the fly wheel to run free on the hub and cap which are fastened to the crank shaft as shown.

Fig. 4 shows a jig used in removing the centre portion of the clutch pin P. The mandrel is a short shaft, having the same diameter as the crank shaft, and the hub and cap are the same with the exception that the hole in the cap is bored clear through so as to work the mandrel between the lathe centres. The hub H. is keyed to the shaft and the cap C. is free to move along the mandrel for any variation in the space x and secured by the set-screw s. The pin is kept in position by the set screw through the hub and bearing on pin P. The part of the clutch pin shown shaded is then removed.

Fig. 5 shows the jig used to bore the holes in the cast steel clutch bush B. A. is a cast iron piece with a hole bored in it to receive the clutch bush B. The boss on the back is turned to fit a recess in the face plate, care being taken to have the center of boss the same distance from center of hole as the center of the clutch bush is from the centre of the clutch pin holes. The four holes are then bored and the bush placed in another chuck, the centre hole drilled. The remainder of the stock (shown shaded) is then removed by a large bit drill.

The groove in the crank shaft is planed out by placing the shaft on the center block of the planer and roughing out nearly to size. A tool similar to Fig. 6 is then used to finish the groove the diameter of cutting edge being a little less than the finished clutch pin. To bring the cutting edge of tool to something near a true circle the crude support shown in Fig. 7 was arranged on the emery jack. A small hole is drilled through the center of the tool and countersunk as shown this hole rests on the center c of shaft s.. The support is then revolved and the cutting edge of tool brought to the required size.

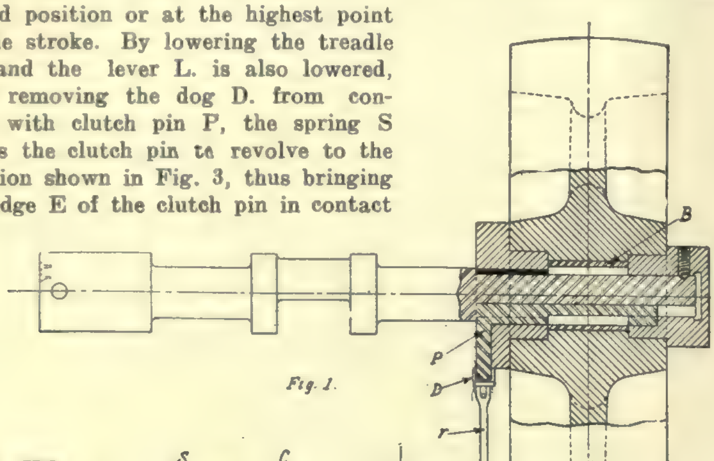


Fig. 1.

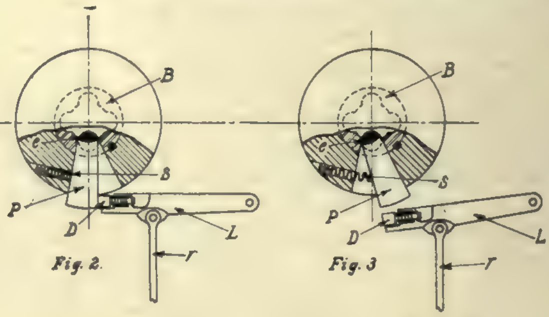


Fig. 2. Fig. 3

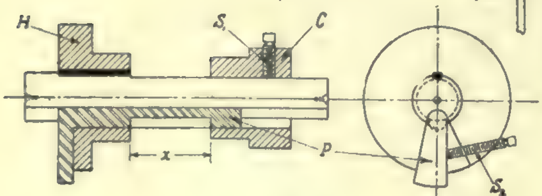


Fig. 4.

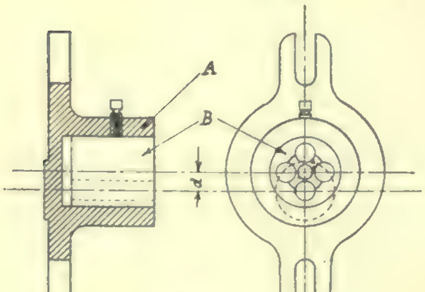


Fig. 5

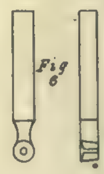


Fig 6

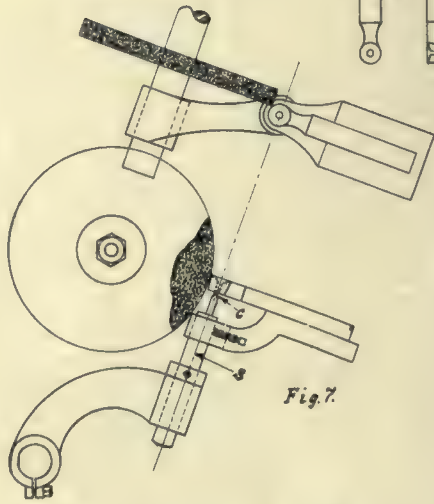


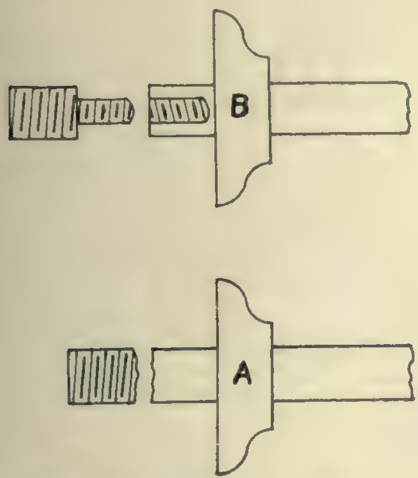
Fig. 7.

Power Press Clutch.

REPAIRING BROKEN SAW MANDRELS.

By Hugh A. Carmichael.

This may not be a strictly new idea, but it is one we now make use of very frequently in repairing mandrels when the eye pin is broken off, as shown at A in sketch. After centreing mandrel in lathe, using steady rest on end with collar on, we true off broken end, then run a drill into this end, about one and a half inches, using as large a drill as size of shaft will allow. This hole is then bored out true and a good thread chased in it, using same number of threads as was used on piece broken off which saves changing gears on lathe when this thread is cut. The mandrel is taken out of the lathe and a short piece of the right size steel shaft is centred up, one end of which is threaded to screw into the hole made in end of mandrel, as snugly as possible. After screwing this in, using a pipe wrench, the mandrel is again put in lathe and a thread chased on other end of piece inserted, to correspond with piece broken off, using same nut. This makes a first class job and is very easily done. B shows the repaired mandrel.

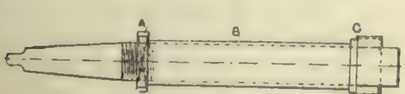


Repairing Broken Saw Mandrel.

A FACING CUTTER BAR.

By B. K. Y.

The accompanying sketch shows a very handy form of cutter bar which eliminates the annoyance of broken screws and packing. It consists of the ordinary form of bar with a thread and nut A at the collet end, a loose sleeve B made of gaspipe, and a collar C. To fix the cutter simply tighten down nut A against the sleeve; this holds the cutter very firmly, and also ensures it being true against back and front faces.



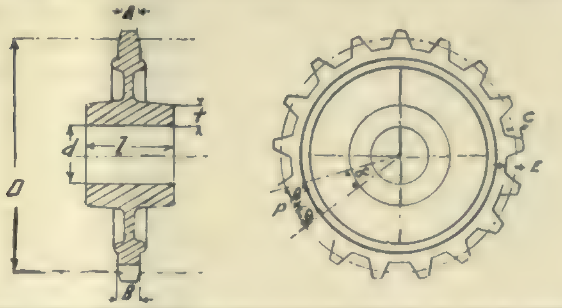
Facing Cutter Box.

DIMENSIONS OF SPROCKET WHEELS.

By W. Laird Ketchen.

The accompanying line cut gives the rules for finding the dimensions of sprocket wheels and should be useful for mechanical men and draftsmen. Sprockets are coming into a great deal of use and mechanical handbooks contain very little data on the subject. Before I originated this rule, sprockets had to be laid out graphically.

—DIMENSIONS OF SPROCKET WHEELS—



No. of Chain	Pitch of Teeth P	A	B	C	E	Working strain in lbs	Effective pull in lbs	[illegible] feet per min.
25	·90625	3/16	5/16	3/16	3/16	75	45	1000
32	1·140625	5/16	7/16	1/4	1/4	150	90	1000
33	1·390625	3/8	1/2	1/4	1/4	200	120	1000
34	1·390625	3/8	1/2	1/4	1/4	225	135	1000
35	1·625	7/16	5/8	9/32	9/32	250	150	1000
45	1·625	7/16	5/8	9/32	9/32	350	210	1000
52	1·5078	1/2	3/4	1/4	11/32	500	300	900
55	1·625	7/16	5/8	9/32	9/32	450	270	800
57	2·3125	9/16	13/16	3/8	3/8	600	360	700
62	1·663	5/8	7/8	1/4	7/16	650	390	700
67	2·3125	9/16	3/16	3/8	3/8	700	420	600
75	2·625	5/8	1	7/16	7/16	750	450	500
77	2·3125	9/16	13/16	3/8	3/8	800	480	500
78	2·625	5/8	1	7/16	7/16	1000	600	500
85	4	1 5/8	2	1/2	1/2	1300	780	400
[illegible]	2·625	5/8	1	7/16	7/16	1200	720	400
95	4	1 5/8	2	1/2	1/2	1600	960	400
103	3·09375	13/16	1 3/16	7/16	11/16	1800	1080	300

All dimensions in inches

N = No. of teeth

D = Dia. of Wheel

d = dia. of shaft

P = Pitch of Teeth

t = thickness of metal in hub

l = length of hub

α = angle at apex } of triangle formed with pitch as base — centre of circle as apex.

β = angle at Base

$$D = 2\left(\frac{P \times \sin\beta}{\sin\alpha}\right) \qquad t = \frac{D}{96} + \frac{d}{8} + \frac{5}{8}'' \text{ (approx) (Box's rule modified)}$$

$$\alpha = \frac{360}{N} \qquad \beta = \frac{180-\alpha}{2} \qquad l = 2d$$

Example Sprocket wheel 30 teeth 75 chain bore $2\frac{1}{2}''$

$$\alpha = \frac{360^\circ}{30} = 12^\circ \qquad \beta = \frac{180^\circ - 12^\circ}{2} = 84^\circ$$

$$D = 2\left(\frac{2{\cdot}625 \times \sin 84^\circ}{\sin 12^\circ}\right) = 2\left(\frac{2{\cdot}625 \times {\cdot}966}{{\cdot}2079}\right) = 25{\cdot}15'' \text{ dia. at pitch line}$$

$$t = \frac{25}{96} + \frac{5}{16} + \frac{5}{8} = 1\tfrac{3}{16}'' \qquad \therefore \text{dia. of hub} = 4\tfrac{7}{8}''$$

To find the weight of castings, multiply the cubic inches by 0.27 for iron, 0.29 for steel and 0.30 for brass.

SOME SHOP DEVICES.

By F. J. Deegan.

A shop where I worked made sketches from the blue print on common pad paper. When a job was finished the sketch was destroyed notwithstanding that this part was a regular part of the machine made over again. The feature of a card of this kind is that it

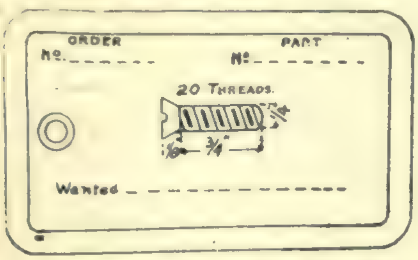


Fig. 1.—Tin Frame for Sketches.

will not be destroyed, having a tin frame of heavy cardboard and shellacked after the sketch made to prevent mistakes being made. It can be used for small interchangeable manufactured parts. A new sketch doesn't have to be made every time more of them are to be made.

Figure 2 is a small tool which should be in every man's kit. It is for loosening tight screws, especially those that can not be gotten out with the screw

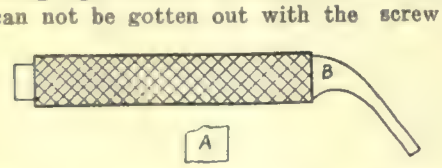


Fig. 2.—Small Tool for Loosening Tight Screws.

driver. With a tool like this a few taps with the hammer will loosen it or tighten it either if that is desired. A shows front view, B is the side view of tool.

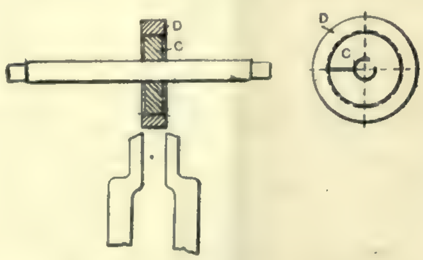
Fig. 3 shows a method of making lathe centers. In my estimation is beneficial in more ways than one in saving in cost of construction and time. It consists of tapes with internal thread tapes and can be made of machinery steel, centre point of tool steel threaded or if you wish, instead of threaded parts, you would have them tapered, but it is my opinion that the thread is more durable.

Fig. 3.—Making Lathe Centres.

The feature in these centers is the saving of time. When joint is worn down you can readily insert a new point having a small quanity in stock and not take the time to turn a new taper. On large centers this ought to prove a saving. I think that it in no way impairs the accuracy of the center having a pin inserted or screw to hold it in place. Every center should be ground before using and after inserting this point it is not necessary to take it out until worn out.

FACING-UP NUTS.

The accompanying sketch shows a neat method of truing up nut faces after being made in the capstan lathe. This is an unsatisfactory job to do in a lathe chuck, as it does not ensure the faces being true with the thread or each other, besides needing two settings. Make an arbor with a few thousands of an inch taper, and a collar C bored to fit small end of the arbor, screwed on the circumference to fit the nuts, and split halfway through. Screw nut D on to C and



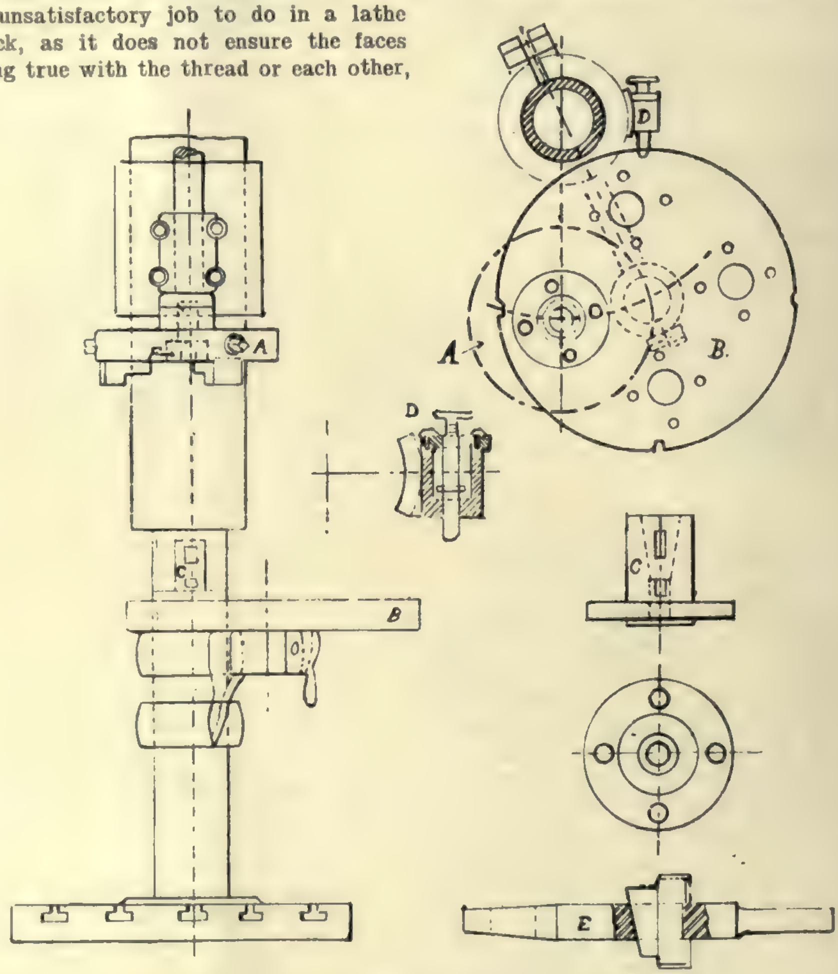
Facing Nuts.

drive both on to arbor. If two knife tools are set to cut the correct width, both sides can be finished at once, and all nuts will be the same thickness without any trouble.

DRILL PRESS FOR TAPPING BORING AND FACING.

By Wm. J. Hurley.

While going through one of our machine shops here I saw quite a novel



Drill Press for Drilling, Tapping and Facing.

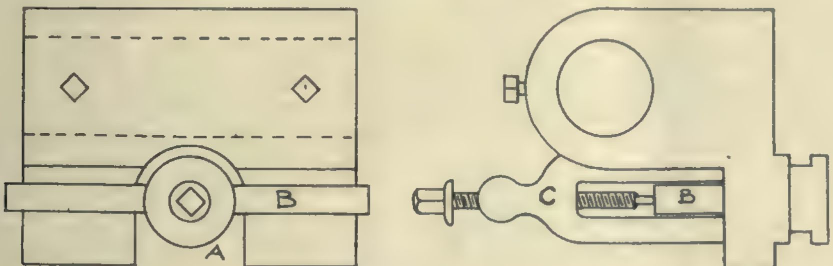
way of fitting up a drill press for tapping, boring and facing small pipe fittings and flanges. When doing them the old way it required a lot of time changing the different tools on the spindle of the machine.

A is a small powerful universal chuck. Fitted to the spindle B is the table, bored as shown, to receive four tool holders like C, these having taper holes in which the boring bars and drills are to fit. The table has four notches for latch D. After releasing the latch the table can be turned and any of the four tool holders can be brought perfectly central with the chuck A, the latch D holding the table in different positions.

BORING TOOL.

By J. Stevenson.

The boring tool shown on page 51 of the January issue Canadian Machinery can be improved, I think by making the holder as shown in the accompanying illustration. A represents a slot in



Boring Tool.

the casting large enough to clear the tool past C.

When in use a piece of steel or a tool B is put in the tool post so that the tool rest is clamped tightly to the carriage. This slight change makes the tool described in the January issue much easier to put in place. Besides it saves time bolting to the lath tool rest and may be very quickly removed when the operator requires to use an ordinary tool.

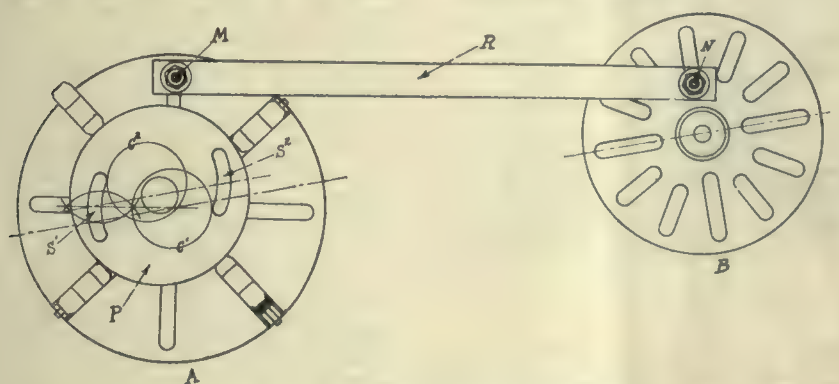
CUTTING ECCENTRIC SLOTS IN THE LATHE.

By J. H. R., Hamilton.

The sketch herewith shows an attachment arranged on two lathes for shaping out the two eccentric slots S-1, S-2 in the plate P.

The two circles C-1 and C-2 are scribed on the surface of the plate concentric with the slots S-1 and S-2 making it easier to set the plate true in the lathe.

A stud M. is secured in the slot of the chuck also a stud N, in the face-



Cutting Eccentric Slots in a Lathe.

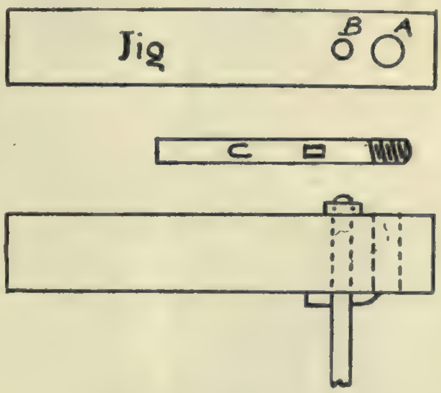
plate of the other lathe (placed so as to give the desired stroke where the tool is cutting the slot).

A rod R the proper length is put on the studs so that when power is applied to lathe B. the desired amount of stroke is transmitted to the chuck on lathe A.

A shaper would also answer the place of lathe B, but a man must be governed by the lay of the tools in the shop.

TOOL FOR DUPLICATE PARTS.

The bar, out of which the jig is made, is $\frac{7}{8}$x$\frac{1}{2}$-in. and 8 in. long. A is for stock and in the shop where this jig is used, one size used is $\frac{1}{2}$-in. B is $\frac{3}{8}$-in. diameter



Tool for Duplicate Parts.

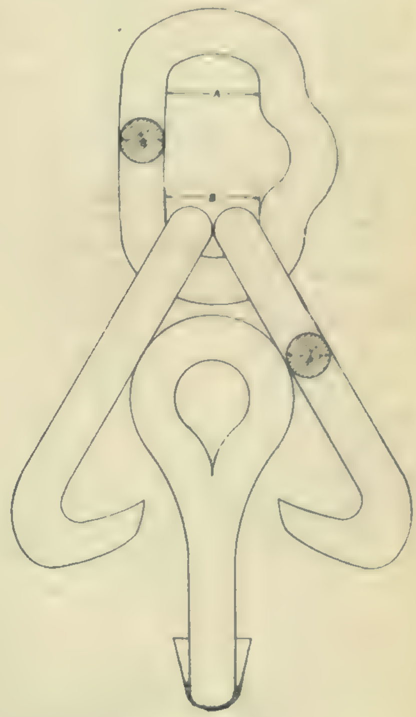
and holds the tool. The stock to be machined is $\frac{1}{2}$-in. cold rolled steel and $\frac{1}{8}$-in. full is to be removed. The length of cut is $3\frac{1}{2}$ in. and 30 are chucked and machined per hour.

The tool is gripped in the tool post and there is no centreing. The feed is 3 in. per minute and the spindle of the lathe runs at 525 revolutions per minute.

C is the tool holder and is $\frac{3}{8}$-in. square steel with a taper $\frac{3}{8}$-in. thread at one end. This slips through B and the cutting tool is drawn up against the jig by means of a nut. At A the jig is hardened and made smooth.

CASTINGS LIFTER.

The accompanying cut illustrates a very useful castings lifter. It is used by a Hamilton manufacturing company in three different forms. In the one



Castings Lifter.

shown the arms are in position for a small casting. For a wider casting the link is turned so that the arms are at A and B and the lifting hook catches in the curved iron. The material used in the construction is $\frac{3}{4}$ inch round.

Another link is 3 in. wide at A and 2 in. at B and is 8 in. long, with a short chain link connecting the arms to the large link. The lifting hook finds its own center in the link. This lifting arrangement will take in a very wide casting.

A third arrangement has a link with arms similar to the second. Instead of one chain link connecting the large link and arms, however, a chain 30 inches long is used. This is used for the handling of rough castings. The first two are the most used and cover the greater range of castings handled.

D. L. Jones has been appointed locomotive foreman, Melville, Sask., with charge of the motive power and car departments.

NEW EQUIPMENT *for* POWER PLANTS

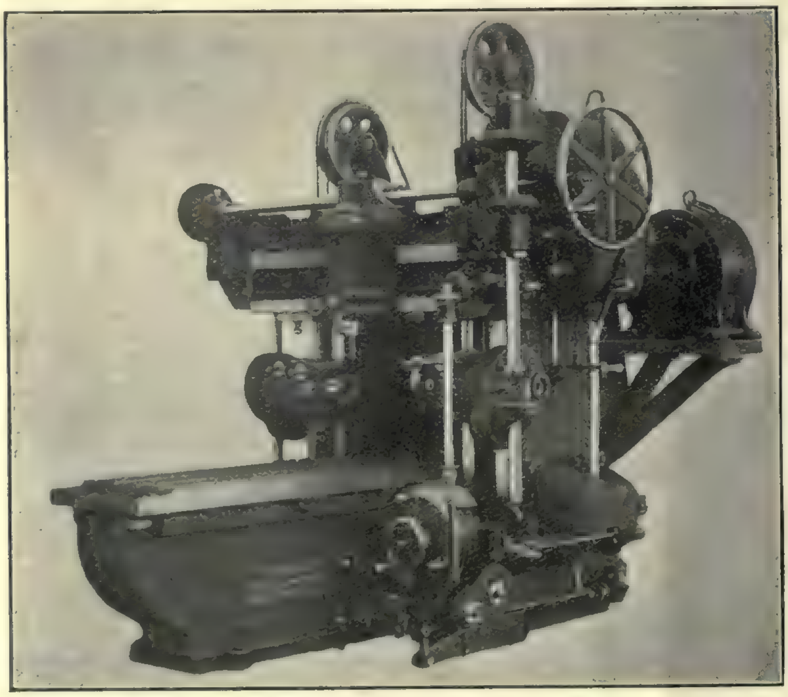
To Have a Place in this Department the Machine or Appliance Must Have New and Interesting Features — No Write-Ups Can be Used.

MOTOR DRIVEN THREE HEAD MILLING MACHINE.

The tool is made particularly for milling engine bases and transmission cases of automobiles. It is also adapted for any other work which may be machined on either a planer or milling machine. The three spindles have speeds varying from 15 to 120 R.P.M. The speeds are arranged for face mills up to 10 inches in diameter for steel or cast iron, but for aluminum work larger cutters may be used. The machine has a capacity of 26 inches between the ends of the horizontal spindles, and 24 inches between the table and vertical spindle.

The motor equipment consists of a 15 horse power, direct current, shunt wound, Westinghouse type S motor. The motor is mounted on a bracket in the rear of the machine, where it takes up little space and does not interfere with the work or the operator. The speed changes, from 875 to 1,500 R.P.M., are effected by variations in the shunt field by means of a Westinghouse drum type controller, not shown in cut. In addition to the range of speed thus obtained, there are four changes by mechanical means. This enables the cutting speed required by the work to be obtained with exactness and maintained with certainty. In the case of machine tools especially is it desirable to have perfect control and adjustment of the speed ; and undoubtedly the most satisfactory method of obtaining this is by means of the adjustable speed motor and a suitable controller.

The milling machine is made by the Ingersoll Milling Machine Co., Rockford, Ill.

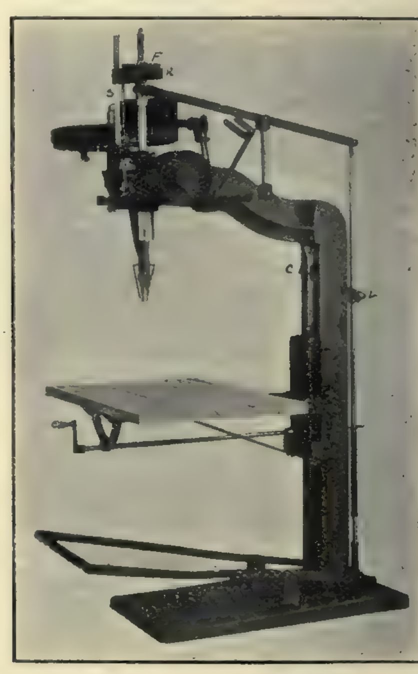


Motor-Driven Three-Head Milling Machine.

SCREW-DRIVING MACHINE.

The machine illustrated herewith is a large and improved screw driving machine. The machine is able to take in very large work as it sets screws to the centre of a 48-in. circle and table has sufficient vertical adjustment to take in work 30 in. high. The table is automatically raised to clamp the work together just as the screw is started by means of a cam C, operated by a lever L, extended through the column and connected to the vertical rod, which connects the foot treadle and spindle operating at the top of the machine. There is a spring support for the table, which yields if an anusual thick piece of work is being operated on. The treadle by which the machine is operated is bowed outward, so that the operator may stand in front or at the side, whichever is most convenient.

In addition to the usual features of magazine feed, adjustable friction drive to the spindle, etc., the machine has a



Screw Driving Machine.

positive stop for the spindle so that screws may be merely started or set so that the heads project to a uniform height if desired. This is accomplished by extending the driven friction flange F outwardly so as to extend over the driving flange and forming a male cone clutch surface on its periphery. A ring R concentric with the spindle and having a corresponding female cone surface is arranged to slide freely vertically on a rod S, being carried upward by the arm which operates the escapement cams and following the arm downward until arrested by the collar T, which is adjustable on the rod. The spindle continuing downward the clutch surfaces engage arresting the rotary motion of the bit, the friction flanges which drive the bit being at the same time slightly separate, preventing undue wear. This machine is built by the Reynolds Machine Co., Rock Island.

BATEMAN TOP-SPEED RAIL PLANER.

The Bateman topspeed rail planer is a most massive tool, with great rigidity, so that when taking maximum cuts with the heaviest feed there is no chatter.

Four tools are employed simultaneously. They are held in two massive tool boxes, borne upon a crossrail some 20½ in. deep, and strengthened by an arched back. The support given to the crossrail by the housings is practically solid, for the latter have large, strong bases, and are securely tongued and bolted to the bed, which is itself solid to the ground. In the centre portion of the bed it is continued 13 in. below the level of the floor, making a total depth of 36 in. It is of a strong box section, the sides being stayed by numerous cross-bars, also of box form. The sliding ways for the table are "flats," provided with automatic lubricators. The table is deep and well ribbed, the rack being cut from a solid steel slab.

Any cutting speed between 18 and 60 feet per minute can be given, and the return speed is 110 feet. On the cut stroke there are 4,042 square inches of belt for each foot of table travel, and a cutting power of 1 in. in depth, 22 feeds per inch, with 4 tools cutting simultaneously in steel of 45 tons tensile strength is guaranteed.

The change speed gearbox, which gives three cutting speeds, can be fitted, and the machine is adaptable for driving either by belt or by electric motor.

The principal dimensions are as follows:

Width between housings, 40 ins.

Height under crossrail, generally 12 in.

Length of stroke, 10 in. longer than the normal; made any length from 10 feet long, rising 2 feet at a time.

Length over all about 75 per cent. longer than the table.

Feed range, from 43 per 1 in. to 4¾ per 1 in.

Height of countershaft, 8 ft. 6 in.

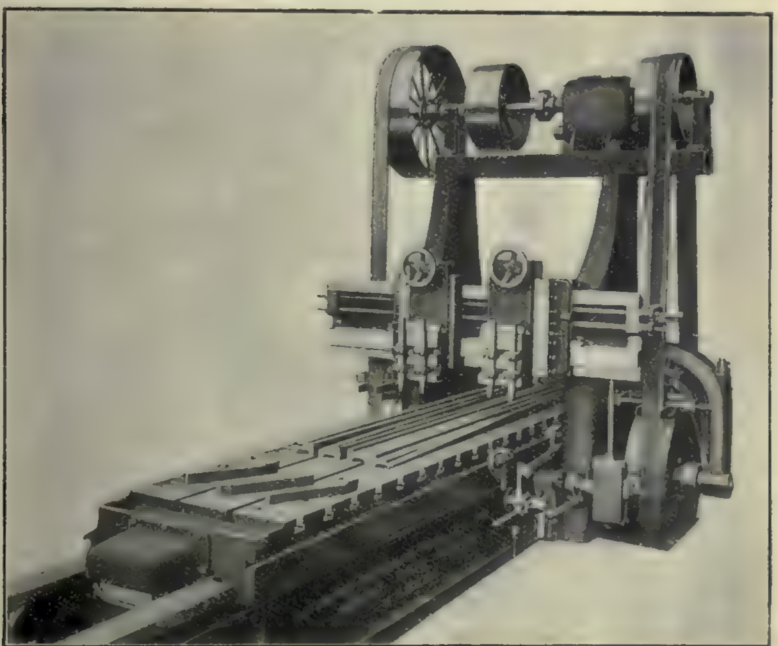
Width overall, 9 ft. 4 in.

Width of table, 33 in.

Bull or rack wheel, 48 in. diameter, 7 teeth engaging simultaneously with the rack.

The effect of the patent flywheel drive on this machine is shown by the speed tests given in the following table, and taken from a 20 ft. rail planer, fitted with 3 speed gearbox.

The loss of efficiency includes losses due (a) to belt slip between countershaft to driving pulleys; (b) to reversals; and (c) to accellerations.



Bateman Top Speed Rail Planer.

Speedometer Readings		Length of Stroke	Time of 10 Cycles of Cut and Return		T.M.C. or Theoretical Mean number of feet cut per minute	M.E.C. Mean Effective Cut or number of feet of work actually cut per minute	Efficiency
Cut Speed	Return Speed						
Feet per Minute	Feet per Minute		Mins.	Secs.			
38	110	9 ft. 6 in.	3	29	28.1	27.27	.9705
29	110	9 ft. 6 in.	4	23	22.5	21.62	.9631
22½	110	9 ft. 6 in.	5	10	18.95	18.387	.9703

These planers are manufactured by Bateman Machine Tool Co., Leeds, England.

UNIVERSAL MICROMETER AND SURFACE GAUGE.

The accompanying illustrations show the universal micrometer and surface gauge in various positions. Fig. 1 shows the bar of the micrometer held in the base clamp to be used as a bench instrument. In this position any measurement from 0 to 7 inches can be taken. The bar can be shifted endwise to any desired position in the base clamp and by a quarter turn backward the instrument can be lifted out of the clamp and placed in position to permit the sliding head to be moved to the desired unit on the bar as indicated by the figures. As shown in Fig. 1, the instrument to be used in the hand will measure round work four inches in diameter and flat work to 7 inches by thousandths of inches. The bar is flattened on one side as shown and the inch positions are determined by conical holes in the centre of this flat. To set the measuring head to the required position on the bar, it is only necessary to slide the head to an approximate position as indicated by the figures and screw the locating pin down until its end seats itself in the hole in the bar. This operation positions the head accurately on the bar and clamps it rigidly at the same time. The

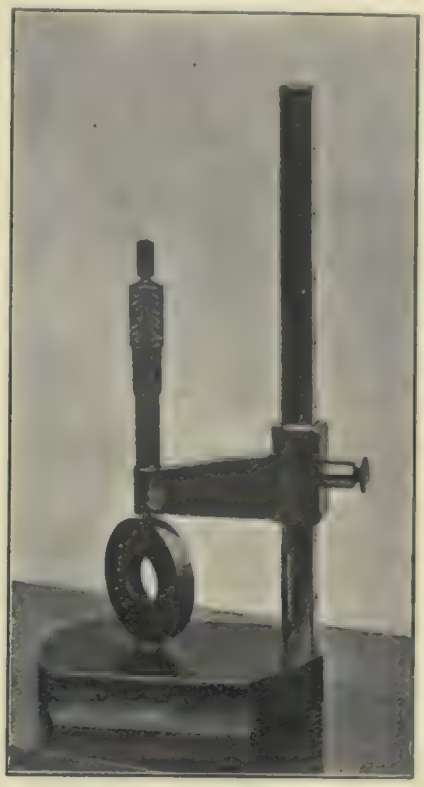


Fig. 1.—Used as a Bench Instrument.

bar, as well as the locating pin and the bushing which guides it, are hardened, ground and lapped.

Fig. 2 shows the instrument with anvil head removed, and the bar micrometer head in position over the base anvil with a two-inch disc between the measuring surfaces. From 0 to 7 inches can be measured in this manner. The distance from the bottom of the base to

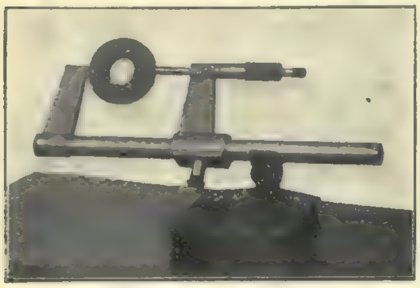


Fig. 2.—Measuring Two-inch Disc.

the anvil is one inch. With the head positioned to the second hole of the bar 0 to 1 inch can be measured. The bar is drawn to its seat in the base by the same screw used in connection with the anvil head.

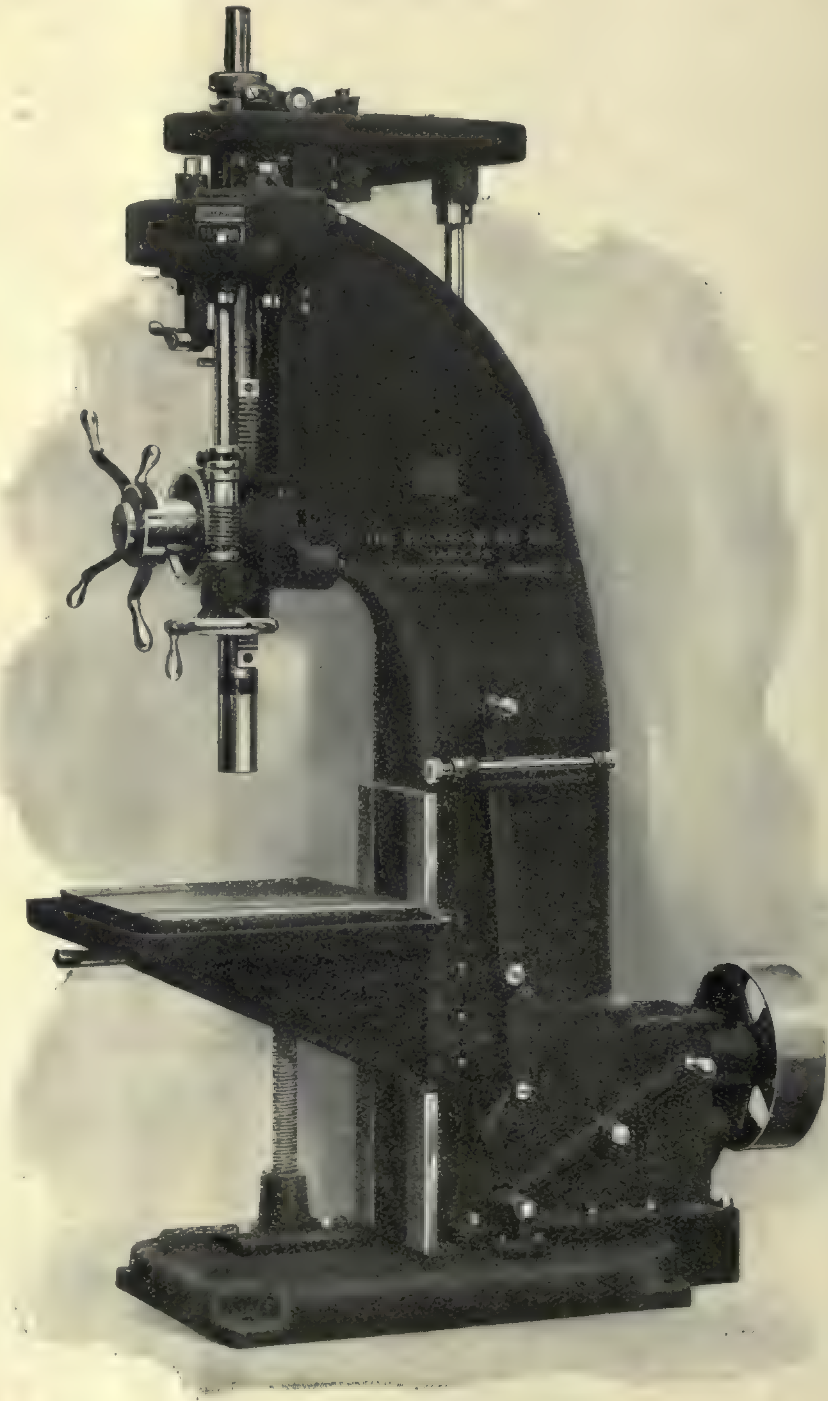
The micrometer can also be used as a scribing gauge and in other positions to suit the measurements to be taken.

This micrometer and surface gauge is manufactured by the Schellenbach-Hunt Tool Co., 14th and Plum Sts., Cincinnati, O.

FOOTE-BURT HIGH DUTY DRILL.

This machine has a capacity for high speed drills from $\frac{1}{2}$ in. to $1\frac{3}{4}$ in. in solid steel to their full cutting edge capacity. The same is of the most rigid construction possible, with the highest grade material, for the different requirements used. All bearings are bronze bushed and are provided with liberal oil grooves. The machine is single belt driven with no shifting of belts required. All speed and feed changes are through a quick change gear device. Levers for stopping and starting machine, and for changing feeds and speeds are all conveniently located and within easy reach of the operator at all times. Spur gears are used throughout, except one pair of slow running two to one bevel gears at the driving end and one worm and worm gear for the feed.

The spindle is of forged high carbon steel, fitted with ball bearing thrust. Three changes of geared feed are provided; any one of which is instantly available by simply shifting a lever, conveniently located at front of machine. All feed changes can be made without the necessity of stopping the machine. Power feed is provided with adjustable automatic stop and hand stop. Hand feed is through worm and worm gearing, and quick traverse of spindle in either direction is accomplished through the spider hand wheel, located at front of machine, which, with either the in or out movement of



Foote-Burt High Duty Drill.

any or all of the handles, engages or dissengages the same.

The table is of the bracket knee type, having a large square lock bearing surface on the upright, to which it is securely gibbed. It is further supported and elevated by a square thread jack screw, located underneath, slightly back of the center of spindle, to permit boring bars or other tools passing through the table. It is also provided with liberal oil groove and two tee slots.

The drive is a self-contained unit, neatly located in base of machine. The nine spindle speeds are through a double train of gearing, which is always in mesh and runs in a bath of oil. This device consists of a lock disengaging any one of three gears in each of the two trains, giving the nine speeds, any of which is instantly available by shifting the levers, located at side of machine, to the different locations for different speeds, as indicated by index furnished. One pair of two to one bevel gears are securly housed at

the end of speed box, inside of column, which make the connection to the vertical driving shaft, and the distance between the vertical driving shaft gear and the spindle gear, being spanned by an idler spur gear, overcoming the necessity of but one pair of bevels in the construction of the entire machine.

The drill is manufacturing by the Foote-Burt Co., Cleveland.

THREE-CORNERED DRILL THAT BORES SQUARE HOLES.

A three-cornered drill that bores square holes and that can be used on any ordinary lathe drill press, or milling machine has been placed on the American market. The new machine bores a square hole nearly as rapidly as

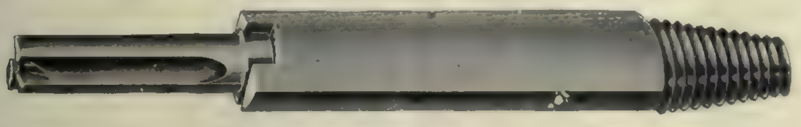


Fig. 1.—Three-Cornered Drill that Cuts Square Holes.

a round drill can bore a round hole. The same idea can be applied to drilling triangular holes and holes with five six or more sides, as desired. The device by which this is performed is simple in construction, consisting of a special drill, three-cornered in the case of square holes, and a special chuck for holding this tool, which is fixed on the ordinary lathe or drill press.

This chuck contains three parts that move independently of one another. First, a part which screws onto the spindle of the drill and revolves with the latter, second, a stationary part which rides upon the part first mentioned, and third, a holder into which the shank of the drill is screwed.

This holder is caused to rotate with part first mentioned, but is at liberty to move sideways a certain distance in any direction. Its exact motion is determined by a guide in the second part of the chuck, which surrounds the shank of the drill. The shank of the drill is three-cornered, but not exactly triangular, that is, the three sides are convex, being formed by arcs of circles struck from centres at the opposite corners. The three-cornered shank just fits into the square guide, and as the shank turns about in the guide, which is held stationary, the three corners of the shank in turn enter into each of the four corners of the guide. At the same time the three corners of the cutting head strike out the sides of the work. The cutting edges are on the end of the tool, not on the side, being in this respect similar to the ordinary twist or flat drill. For drilling holes of different sizes only one chuck is required, the guide in the chuck being so constructed that the opening can be enlarged and diminished by turning the key.

The motion of the three-cornered shank of the tool within the square plate can be better understood when it is remembered the radius used to strike out the three sides of the shank is just equal to one of the sides of the square formed by the guide. Therefore if one side of the shank is rolling or sliding on one side of the guide, the opposite corner of the shank will be moving in a straight line corresponding to the opposite side of the guide; i.e., during a certain part of the revolution, the corners of the tool travel in straight lines, along the outside of the square. By trying this out with a small model it will be found however, that there is a small space in each corner where the rolling motion ceases, so that the corner is blunt and not sharp.

While blunt cornered holes are satisfactory for the great majority of uses, there are cases where a sharp cornered hole is desired, and this is secured by a special construction in which the tool is made smaller than the shank and one of the corners of the shank is rounded. The exact shape of the shank in this case has been determined by a careful cut-and-try method, and as templets have been made for each size, any number of tools can be duplicated in the right shape and size for each size of the hole to be bored.

For the introduction of the device in America, a concern has been organized under the name of the Radical Angular Drill Co., which has established offices and has a machine on exhibition at 114 Liberty St., New York City. At this place a milling machine has been fitted up with one of the chucks, which, however is of such a type that it could be applied to a drill or lathe with equal facility. Where the chuck is to be used on a machine regularly and continuously it is possible to simplify the construction somewhat by making the stationary part of the chuck a permanent part of the machine.

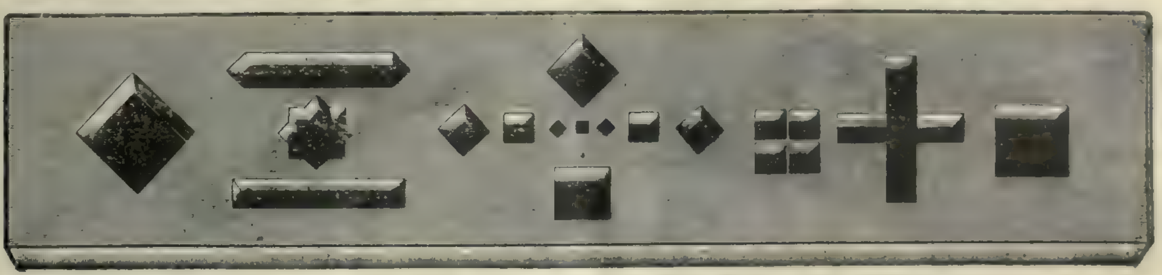


Fig. 2.—Holes Cut by Three-Cornered Drill.

SHORT SOCKETS AND SLEEVES.

Every user of taper shank drills has had a number of them put out of commission on account of broken or distorted tangs, caused principally by worn or poorly fitting sockets. Such drills are in most cases consigned to the scrap pile which is necessarily a very expensive practice.

The meet the growing demand for a device to utilize such drills, The Standard Tool Co. are making the "Economy Short Sockets and Sleeves."

Fig. 1.—Economy Tang Gauge.

To provide a new tang to fit these sockets, the Economy Tang Gauge is used. By slipping it over the shank of the broken drill as shown in Fig. 1, a new tang can be marked of the correct size and position, which is then shaped either by milling, planing, filing or grinding. The new tang is heavier and stronger than the old one.

The shanks of the Economy Sockets and Sleeves are made of regular dimensions and will fit the spindles of all the leading makes of power drill presses. They are manufactured by The Standard Tool Co., Cleveland.

POWER GENERATION AND APPLICATION

For Manufacturers. Cost and Efficiency Articles Rather Than Technical.
Steam Power Plants ; Hydro Electric Development ; Producer Gas, Etc.

WELDING BY OXYGEN WITH HYDROGEN OR ACETYLENE.

By Emil Stern.

The atmosphere which surrounds us contains 76 per cent. of nitrogen and 24 per cent. of oxygen. In any ordinary flame the oxygen is used as a necessary accessory, while the nitrogen has to be carried through the process of combustion as a useless burden tending in every case to reduce the heat of the flame. So it is obvious that wherever a hot flame is required the use of pure oxygen will be of great advantage, supposing the increase of heat justifies the extra cost of buying or making pure oxygen.

For welding the application of pure oxygen as used within the last few years, has been a remarkable success, especially when used in connection with hydrogen or acetylene.

When using compressed gases it is necessary to use reducing valves to reduce the pressure to from 7 to 30 lbs. per square inch, at which pressure the gases are conveyed to the burners by rubber tubing, where they are thoroughly mixed. The gases enter the burner at a sharp angle, entering first a small mixing chamber. On account of the high pressure the excess of hydrogen and a small nozzle being used to increase the speed of the gases, the flame will not fire back. The mixture 4:1 generates a temperature of 3400 degrees F. (1900 centigrade), which will melt any metal. Sheet iron may be welded by hydrogen in sizes up to ⅜-inch. For thicker sheets the cost does not permit of using this process economically. On the other hand, very thin sheets require great care and skill as they melt and get holes very rapidly. A clever welder can weld sheets as thin as 1-132-inch.

The temperature of the flame depends largely on the quality of the oxygen. Commercial oxygen, as a rule, does not contain more than 96 per cent. of pure oxygen, the balance being nitrogen. The purer the oxygen the higher the flame temperature; the more nitrogen mixed with the oxygen, the lower the temperature. It might be possible by purposely diluting the oxygen to obtain a temperature which permits of welding safely very thin sheets. This would be important for many industries, for instance, in the manufacture of graniteware.

Since last year a new system has been applied for welding, which uses a mixture of acetylene and oxygen. Ten years ago trials were made to use acetylene for obtaining high temperatures. The results were not favorable, because the burners used did not fill the requirements caused by the inflammability and high contents of carbon in the acetylene.

Great Heat of Acetylene-Oxygen.

1 cubic foot of acetylene gas contains 1,550 B.t.u.

1 cubic foot of hydrogen gas contains 342 B.t.u.

1 cubic foot of acetylene-oxygen mixture contains 575 B.t.u.

1 cubic foot of hydrogen-oxygen mixture contains 274 B.t.u.

The calculated flame temperature of the acetylene-oxygen flame is 7,800 degrees F. The actual flame temperature is far below this point, probably around 5,500 degrees F.

The little blue acetylene-oxygen flame will melt anything, iron, carbide, brick and fireclay, graphite only will not melt. The high temperature of the acetylene-oxygen flame permits of welding large pieces, little heat being radiated until the welding temperature is reached.

A hydrogen welding seam looks distinctly different from an acetylene welding seam, the hydrogen tempering strip being about 2 inches wide, the acetylene tempering strip being less than 1 inch wide. This accounts partly for the cheapness of the acetylene process compared to the hydrogen process.

The price of welding per foot depends on the size of the material and the skill of the welder.

Manufacturers interested in the sale of the welding apparatus estimate the cost of welding 1 foot as in the accompanying table:

Cost of welding 1 foot of sheet iron.

	Hydrogen welding.			Acetylene welding.			
Thickness of sheet.	Cost of hydrogen and oxygen f.o.b. Toronto.	Welders' wages at 40c. an hour.	Total.	Cost of acetylene and oxygen f.o.b. Toronto.	Welders' wages at 40c. an hour.	Total.	Total, including capital charges for instalation.
Inch.	c.	c.	c.	c.	c.	c.	c.
1-64	.5	.1	1.5	...	...	...	...
1-32	1	1.2	2.2	.3	1	1.3	1.5
1-16	2	2	4	.8	1.5	2.3	2.5
1-8	7	3.5	10.5	2.5	2.2	4.7	5.2
3-16	16	5	21	5	3	8	9
1-4	30	6	36	10	4	14	16
3-8	50	8	58	20	5	25	28

These figures are much too low for practical use, especially when used outside the shop the cost may safely be figured to be three times as high. For safe calculation, not only material and wages, but interest and depreciation must be figured as well.

The hydrogen instalation is the cheaper one, its price being about $100. Acetylene plants are about $200—up to 3-16 inch, about $300—up to ¼ inch.

Large plants up to 1¼ inches capacity with 5 Fouche burners, cost about $1,000.

The stability of the welding seam is of special importance. Evidently it depends largely on the quality of the hydrogen or acetylene. Above all, the gases have to be free from arsen and phosphor which two elements are known to make iron brittle. The skill of the welder is another important item. The material which is melted in the welding, also affects the stability. Consequently the stability of the welding does not entirely depend on the stability of the iron to be welded. Various tests have been made. Tough sheet iron—Swedish charcoal iron—gave the best results. The welding seam was in every case stronger than the original piece, which would always tear before the seam would tear.

Steel wire did not weld satisfactorily at all; the welding seam was brittle, the stability only amounting to 75 per cent. of the original piece. Practice shows that the stability is not reduced if skill and care is used.

It depends on the purpose for which it is used whether hydrogen or acetylene welding plant should be installed. The hydrogen plant is preferable for occasional use, for thin sheets, for repairing and for metals that melt easily. The apparatus is simpler, easier to operate and easier to move, there is less danger and the success is safer than with the acetylene plant. On the other hand acetylene permits of welding heavier pieces, and it will be cheaper in the end when in steady use, though the first cost is much higher. It is not so suitable for repair work and for moving. In a large shop long pipes will be required. No license is required for the instalation. The acetylene plant is especially suited for welding cast iron. In one instance the flange of an automobile cylinder was broken and repaired under guarantee for $35. A new cylinder would have cost $150.

CANADIAN MACHINERY AND MANUFACTURING NEWS

A monthly newspaper devoted to machinery and manufacturing interests mechanical and electrical trades, the foundry, technical progress, construction and improvement, and to all users of power developed from steam, gas, electricity, compressed air and water in Canada.

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Vol. V. FEBRUARY, 1909 No. 2

A CENTRAL TOOLROOM.

"A place for everything and everything in its place." These were the words of a sign hanging in a certain machine shop. The foreman was a believer in system and made the sixty or more employees in the machine department live up to it. This was accomplished in the case of tools by a central tool room. When a workman wanted a certain tool, a check with his number on it was hung in the place for the tool, and the workman became responsible for it until it was returned.

This foreman found that this system prevented unnecessary duplication of tools, thus saving a large outlay. It also saves workmen's time hunting for tools. With this system he knows exactly where to find any tool he may require. Either it is in the toolroom or it is being used by a workman whose check is hanging in the place provided for it. If it were computed in dollars and cents the amount of time consumed by workmen in hunting for tools where there is no central toolroom it would be found that a great saving in general expense may be made by a little system.

Another point is to have the toolroom in a central place, thus eliminating unnecessary steps on the part of the workmen. A saving will thus be made. It will not show on the books, but it is one of those invisible economies that shows in the general expense. It removes one of the leaks that consumes workmen's time for which the employer gets no return. By a little time and thought the invisible losses may be eliminated.

GOOD OUTLOOK FOR 1909.

Expressions of opinion as to the trade prospects for the year are all marked with the utmost confidence in the future. There are no signs of doubt as to the trend of business; no lukewarm assertions that trade may be good if such and such a thing permits. But the positive declaration that trade will be good—a declaration based not upon mere optimism itself but upon tangible indications that are apparent to every business man who has bestowed thought upon the situation. And over and above all, each manufacturer is resolved to make his assertion good by exacting the largest share he can of the prosperity that he knows is within his reach. Thus we shall have wheels within wheels quickening upon each other, and all contributing to the great volume of business that will characterize the trading of 1909.

There is no reason to doubt the future. In the first place, the year starts under much better conditions than did 1908. There have been many months of steady building up. Concerns which were severely shaken by the depression, because they had developed beyond their strength, are now back upon a firm basis. The magnificent harvest has enabled farmers to liquidate those heavy obligations that they had in cases incurred through land speculation and too great an eagerness to get rich quickly, while all of us have learned the lesson of moving progressively but steadily.

The whole country breathes vitality and strength. There is the consuming economy of a year to be added to the natural development of a country that is going ahead by leaps and bounds. Capital poured into the country last year and it will do so again this year, while railway construction will be developed more vigorously than ever. Thus, from the Atlantic to the Pacific will there assuredly be a greater development of trade. The constituents are here, the power is here, the energy is here. It must come, and it will come.

TECHNICAL EDUCATION.

The address of Frederick H. Sexton, Director of the Department of Technical Education in Nova Scotia, before the Canadian Clubs in Toronto, Hamilton and London, should awaken such an interest in this subject that will result in technical schools being established in every industrial centre of Canada. Technical education is one of Canada's great problems. Nova Scotia has undertaken the establishment of technical educational courses in a manner that rebounds with credit to that Province.

In Ontario the Provincial Government is assisting the public libraries by loaning books of special interest to mechanics. The work being done in Toronto was described in the December, 1908, issue of Canadian Machinery. In Hamilton a technical school which will be fully equipped for demonstration purposes is being erected. It is also proposed that the Provincial Government erect a technical college in Hamilton.

Director Sexton, of Nova Scotia, pointed out the urgent necessity of a national system of technical education. During the past few months courses used in various technical schools have been described in Canadian Machinery; co-operative education and apprenticeship systems. We have had in view the enlisting of every one interested in the campaign for the education of the mechanic. The Dominion Government assists agriculture under the heading of commerce. Why not aid Canadian industry by the establishing of schools such as those of Germany and Massachusetts.

Technical education in Germany has given her preeminence even though she lacks the natural resources to be found in Canada. We have the chance to build a great industrial nation. Let us choose what has proven good to these two countries and adapt them to ourselves. In this way will be strengthened our position in the manufacturing world.

SOCIETY OFFICERS.

Canadian Railway Club, Montreal.
President, L. R. Johnson; treasurer, S. S. Underwood; secretary, James Powell, Box 7, St. Lambert, near Montreal. Meetings at Windsor Hotel, 1st Tuesday of each month, except June, July and August.

Central Railway and Engineering Club, Toronto.
President, C. A. Jefferis; Sec-Treasurer, C. L. Worth; Room 409, Union Station. Meetings at Rossin House, 3rd Tuesday of each month, except June, July and August.

Canadian Society of Civil Engineers.
Rooms at 413 Dorchester Street West, Montreal. President, J. Galbraith; secretary, Prof. C. H. McLeod. Meetings will be held at Society Rooms each Thursday until May 1st, 1909.

Nova Scotia Society of Engineers, Halifax.
President, J. H. Winfield; secretary, S. Fenn, Bedford Row, Halifax, N.S.

Quebec Branch of the Canadian Society of Civil Engineers.
Chairman, E. A. Hoare; secretary, P. E. Parent, P.O. Box 115, Quebec. Meetings held twice a month at Room 40, City Hall.

Toronto Branch of the Canadian Society of Civil Engineers.
96 King Street West, Toronto. Chairman, C. H. Mitchell; secretary, T. C. Irving, Jr., Traders Bank Building.

Manitoba Branch of the Canadian Society of Civil Engineers.
Chairman, H. N. Ruttan; secretary, E. Brydone Jack. Meets first and third Friday of each month, October to April, in University of Manitoba.

Engineers' Club of Toronto.
96 King Street West. President, A. B. Barry; secretary, R. B. Wolsey. Meeting every Thursday evening during the fall and winter months.

Canadian Electrical Association.
President, N. W. Ryerson, Niagara Falls; secretary, T. S. Young, Canadian Electrical News, Toronto.

Canadian Society of Stationary Engineers.
President, Charles Kelley, Chatham; secretary W. A. Crockett, Mount Hamilton.

Toronto Branch A.I.E.E.
Secretary, W. H. Eisenbeis, 1207 Traders Bank Building.

Universal Craftsmen Council of Engineers. Canada Council.
Chief, Chas. Mosley, 7 Charles St., W.; Secretary, H. E. Terry, 157 Bay St. Meets second Tuesday in each month in Room 2, 4th Floor, Temple Building.

Toronto Branch C.A.S.E.
Meetings 1st and 3rd Fridays each month at Forum Hall, corner Gerrard and Yonge Streets. Pres., F. Stubbs; Secy., W. C. Tait.

CANADIAN CLAY PRODUCTS' MANUFACTURERS.

The Canadian Clay Products Manufacturers held their seventh annual banquet in Brantford, Ont., Jan. 12, 13 and 14.

After registration on Thesday, Jan. 12th, the members were accorded a welcome to the city by Mayor Wood and ex-Mayor C. H. Waterous. A discussion upon Tile Making, led by Henry Janes, Delaware, Ont., closed the proceedings for the first day.

Wednesday, Jan. 13th was devoted to visiting some of Brantford's leading industries. Mr. C. H. Waterous conducted the visitors through the different departments of the Waterous factory and afforded them an opportunity of seeing the leading lines in the actual course of manufacture. A tour of inspection was then made of the Allen Red Brick Works, whose output last season was 1,265,000; the James Workman White Brickyard, and the Brantford Red Brick Company's yard.

An address was delivered in the afternoon by President J. S. McCannell. He spoke on Standardization of the size of brick and technical education. The annual banquet was held in the evening at which the subject of technical education was further discussed.

The next annual convention will be held in Chatham in January, 1910.

CANADIAN RAILWAY CLUB.

The regular monthly meeting of the club, Montreal, was held in the lecture room of the Canadian Society of Civil Engineers on Tuesday, January 5th. The main feature of the evening was Prof. Bancroft's talk on the topography of Western Canada. From a railway man's point of view it was interesting due to the fact that Prof. Bancroft clearly showed how the railways were taking advantage of the natural formation of the land. The talk was well illustrated by good views and maps of the country under discussion.

At the February meeting J. A. Kincead will read a paper on "Spring and Spring Steel," and at the March meeting E. C. Lloyd will read a paper on "Shop-keeping."

CENTRAL RAILWAY AND ENGINEERING CLUB.

The regular monthly meeting of the above club will be held in Room 192, Rossin House, Toronto, on the evening of Feb. 16, when J. M. Dudley will address the meeting on "Railroad Y.M.C.A. work."

NOVA SCOTIA MINING SOCIETY.

The annual meeting of the Mining Society of Nova Scotia will be held on March 3, 1909, at the rooms of the Society, 129 Hollis Street, Halifax, N.S. The annual dinner will be held during the session.

TORONTO E.L.M.B. SOCIETY.

The eighth annual meeting of the Toronto Electric Light Mutual Benefit Society was held recently at the Scott Street plant, for the election of officers and other business. The secretary-treasurer, S. M. Lewis, reported that he had paid out sick benefits during last year amounting to $385.65, and death claims $80, and had a cash balance to divide among the members of $506.85.

The election of officers follows:—Hon. Pres., J. J. Wright; Hon. Vice-Pres., W. Bourne; President, T. Marshall; Vice-President, J. Croucher; Secretary-Treasurer, S. M. Lewis.

PERSONAL NOTES.

A. Chamberlain is in charge of the Belleville Portland Cement Company's new Toronto office, 24 Yonge Street Arcade.

John Coulter, Brantford, has been appointed general manager of the Ontario Portland Cement Company, in place of the late W. G. Elliott.

A. Watt, acting locomotive foreman, Melville, Sask., has been transferred to Wainwright, Alta., with charge of the motive power and car departments.

Charles Ley, of the Canadian Iron Foundry, St. Thomas, leaves shortly for Fort William to become the assistant superintendent of the plant there.

J. C. Houck, superintendent of the Forbes Malleable Iron Works, Rockford, Ill., has resigned to become superintendent of the Valleyfield Iron Works, Montreal.

R. D. Smith, heretofore road foreman of locomotives, Medicine Hat, Alta., has been appointed district master mechanic, district 2, Western Division, with office at Medicine Hat.

J. J. Broadhurst, late metallurgical expert for the James Robertson Co., Montreal, is now in business for himself at 101 Shannon St., Montreal, trading as the Lion Metal Company, smelters and refiners.

The Concrete Engineering & Construction Company, of Toronto, with offices formerly in the Stair Building, have taken up their new offices in the Union Bank Building, Wellington Street West.

Mr. John J. Gartshore, dealer in railway equipment, Toronto, has recently removed to more commodious offices at 58 Front Street West, but still retains his storehouse and yard at his former address opposite the Queen's Hotel.

F D. Lyman, manager of the tube department of John Millen & Son, Montreal; W. K. Gillespie, chief draughtsman, Dominion Car & Foundry Co., Montreal; and Fred. B. Kilbourn, superintendent of the Lakefield Portland Cement Co., Montreal, have been elected members of the Canadian Railway Club.

Several important changes in the Canadian Pacific western divisions are announced, including the appointment of a new superintendent at Brandon. W. J. Uren, at present chief despatcher at Winnipeg, is promoted to the position of superintendent at Brandon. T. R. Flett, who is now superintendent at Brandon, is transferred to be superintendent at Saskatoon, while C. S. Maharg, who has been superintendent at that point, has been transferred to be superintendent at Medicine Hat.

FOUNDRY PRACTICE AND EQUIPMENT

Practical Articles for Canadian Foundrymen and Pattern Makers, and News of Foundrymen's and Allied Associations. Contributions Invited.

METAL MARKETS.

Although trade in Canada has been steady during the month with an improving tendency all the way along, prices in tin and copper have declined. This, of course, has been the result of weakness in the primary markets, consumption in these metals, both in London and New York, being very poor. The jobbing price of tin received two cuts during the month of ½c, and quotations now are ranging around 32c. This decline may have had the effect of stimulating the purchasing of those who were in want of the metal immediately, but it has the tendency of holding off orders for future requirements. Falling prices do not inspire confidence. Purchasers naturally wait to see if prices will go any lower. Inquiries are good however, and there is no doubt that an improvement in the markets would quicken much buying. Tin is so speculative that it may jump up strongly any day in London, but until steady consumption sets in both, London and New York, the primary markets will not show stability.

Copper received a cut of ¼c during the month and jobbing lots are now ranging between 15 to 15¼c. There has been a fair amount of metal passing into consumers' hands and inquiries, as in the case of tin, have been very favorable. Here again a hardening tendency in primary prices would help business along. New York figures show the hammering which the market has experienced from poor consumption. Producers have been trying hard to hold prices by keeping off the market, but this position is difficult to maintain in face of the stagnation in consumption and the enormous rate of production. A strong legitimate demand is imperatively needed.

Pig iron and steel conditions have shown very little change. Canadian furnaces have been reported busy, and prices have been maintained. There has been some talk of finished steel products in the States being shaded, but the improving business appearing latterly will probably put a stop to this. Pig iron prices have been unchanged across the border with business quiet. There is a strong undercurrent of confidence as to the trend of business, and producers are not anxious to book too far ahead. Spelter has kept at $5.50 in the Canadian markets with very steady business doing. Both the London and St. Louis markets have kept firm, and the metal has shown great stability all the way through. Imported lead has declined 10c, and quotations are now at $3.70 with Trail about 10c less. Business has been fair, with a somewhat improving tendency. The English markets at the commencement of the month were on the weak side, but got stronger later. Altogether trade in Canada has been very steady, and there is a strong feeling of confidence as to good spring business. What is wanted to quicken buying is the encouragement of stronger markets.

LITTLE THINGS IN THE PATTERN SHOP.

By John Carr.

As in our ordinary every day life there are many little things which, if given proper attention will greatly help to make our lives happy and successful, so in Pattern making there are many

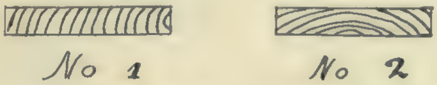

Fig. 1.

little things, which, given their proper attention, help materially in making a perfect pattern, but which slighted, as they too often are, cause trouble after the pattern has left the pattern shop.

One of the little things is choosing the right kind of lumber for the work required. This means more than picking pine that is clear of knots and free from wind-shakes. The grain should be soft and fairly straight, as red stringy pine will twist very readily. For small patterns requiring to be kept for constant use, hardwood should be used. Mahogany, black walnut, cherry and maple are the best kinds for this work. As the choosing of right thoughts is the foundation of a good character, so choosing of the right kind of lumber is the foundation of a good pattern.

Besides choosing the right kind of wood for your pattern in general, it is sometimes necessary to make a particular choice for a particular piece of your pattern. As an instance: it may be necessary to have a loose flat piece put on your pattern with draw pins, or screws that can be taken out to allow pieces to be taken out of sand after body of pattern has been drawn. For such a piece the grain should be quarter cut, that is the end grain should be as shown in No. 1, Fig. 1, not as shown in No. 2, Fig. 1.

Good judgment requires to be used in glueing pieces together. Fig. 2, shows five methods of arranging the grain in glueing up a block. No. 1 will

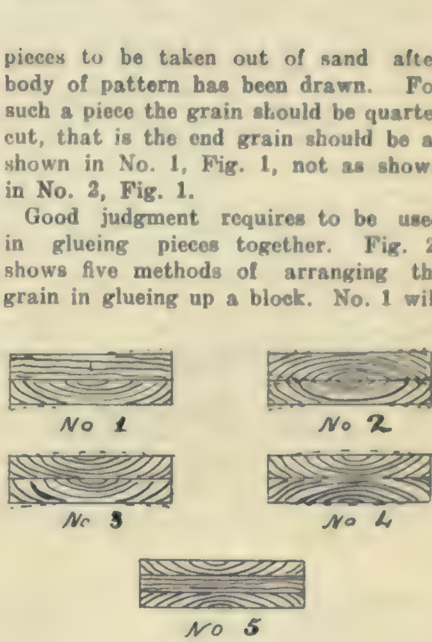

Fig. 2.

twist across the corners, as indicated by dotted lines, No. 2, will open up at the edges, No. 3 will have a tendency to get rounding on one side, and hollow on the other, No. 4, to become slightly rounding on both sides, No. 5 will keep straight and although it takes a little more work, for a permanent pattern it will pay to take the extra time.

When glueing up the segments for a ring, such as a pulley rim, remember that two layers will always twist out of shape, while three layers will remain straight. The reason for this is, when two pieces are glued together one side of each layer is exposed to the action of the air, thereby drying the outer surface more quickly than the centre. Wood patterns will absorb moisture from the sand during the process of moulding, which moisture gradually

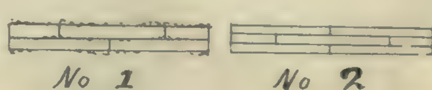

Fig. 3.

dries out when patterns are put away for future use. Fig. 3, shows edge view of such a ring with joints marked in No. 1, as they would appear put together in two layers, the dotted lines showing its tendency to warp. No. 2 shows joints as they would appear when built in three layers. This

pattern will keep its shape as the centre layer is protected from the air on both its sides and will hold the outer layers in position, providing the joints are well made and properly glued.

Just as in your character building, if you do not put your thoughts together intelligently your character will be warped and twisted, so you must use good judgment in building a pattern or it will not keep its proper shape.

It is frequently necessary to nail patterns together in box form. Fig. 4 shows the first step in putting together a box pattern, different methods of nailing a plain board on the edge of another. Most patternmakers think that, if they get their piece in the right place and "hit the nail on the head," their whole duty toward that nail is done. But before they hit the nail at all they should see that it is going to do the most effective work possible when driven home. Referring to Fig. 4, the two nails in each of Nos. 2 and 3, will hold more than the three nails in No. 1, owing to their slanting position, a moment's thought should convince anyone of that. The different disposition of nails in Nos. 2 and 3 is owing to the difference in disposition of grain of board being nailed. No. 2 would have a tendency to curl up at the outer edges. You therefore require to get a sure grip on the outer edges. No. 3 would tend to raise in centre of the board, therefore get your grip as near the middle as feasible. In these days of rush work, most patterns are nailed more or less, and even though glued as well it is wiser to always slant your nails where possible, noting at the same time the grain of your wood. Then drive your nails to the best advantage.

Those are a few of the little things which help to make the difference between a good pattern and a poor one, between a pattern that will stand a lot of use and considerable rough usage in the moulding shop, and a pattern that will go to pieces after being used three or four times. These little things are mentioned here to stimulate thought along these lines and to show the need for having the attention set upon the work in hand.

No 1 No 2 No 3

Fig. 4.

A. F. A. ANNUAL CONVENTION.

The annual convention of the American Foundrymen's Association and allied bodies, including the Foundry and Manufacturers' Supply Association, the American Brass Founders' Association and the Associated Foundry Foremen, will be held in Cincinnati on May 17 and following days. The meetings of the American Foundrymen's Association will be held on May 18, 19 and 20, while the exhibits of foundry equipment and supplies, which will be conducted by the Foundry and Manufacturers' Supply Association, will be open for inspection the entire week. The Hotel Sinton has been selected as headquarters.

Secretary Richard Moldenke in his announcement requests that foundrymen prepare papers and select subjects for discussion at this gathering which can be used by all of the members to their mutual advantage. He states that a mere memorandum embodying the idea will be highly acceptable, and the subjects will be thoroughly discussed by those familiar with the work.

The exhibit of foundry equipment will be conducted under the auspices of the Foundry and Manufacturers' Supply Association and will be held in Music Hall where ample space is provided for both the still and operating exhibits. The first floor of the hall contains about 27,000 square feet of floor space and the second floor about 14,000 square feet.

MAKING MANGANESE BRONZE.*

By J. F. Webb.

To make a manganese bronze, or rather, a manganese brass as it should be called, the mixture generally used is composed of copper, 56 parts; copper manganese, 5 parts; zinc, 36 parts; aluminum, 3 parts.

This mixture is one of the high tension brasses, and there are three points the melter has to keep in mind, namely, tensile strength, elongation and fracture. And when made according to specifications the alloy must not have less than 60,000 lbs. tensile strength and 20 per cent. elongation.

In charging the crucible we put all of the copper in first and with it some of the gates and heads which helps to melt the copper faster, and when all of the copper and gates are melted then we add zinc, then the manganese, and last of all, the aluminum. And I wish to emphasize that manganese bronze can't be mixed and stirred too much. Before the metal is taken from the furnace we have to sample it to see if it is all right, and the way we have of sampling it is to take a long ladle and dip out about a pint and pour what we call a sample bar ¾"x⅝"x9"; this is the melter's test. The test pieces we cool in water, take and stand it up in the vise to try the strength of it, for we can generally judge the strength by the amount of hammering it will stand and how far it will bend before breaking. And if we find it very stiff and hard to bend it needs more elongation. The way to get more elongation is by keeping the mixture in the furnace 15 or 20 minutes longer with a good heat on, and we may also add a small hand scoop of turnings of the same mixture, which will give more elongation and also helps the fracture.

Then we take another sample test bar and go through the same operation in the vise, and should we find it too soft and easy to bend we add a little aluminum to harden it. Sometimes we have to try two or three times before we get the metal where we want it. Then we pour the molds; also pour the standard test bar that goes first to the machine shop to be turned to size and then to the testing room to be tested, and it is there determined whether the castings shall be accepted or not.

But we have sampled this metal so much in the vise that we can generally tell whether it will stand the physical test.

This alloy, like all others, has its own peculiarity; that is, it leaves the sand very clean, aluminum is good for that, but it has a very bad habit of shrinking, and in making a good deal of our work we have to put on such large heads that we often have as much metal in gates and heads as there is in the casting. But the heads have to be there and should there be several hubs or bumps or heavy corners on the pattern there has to be a head to take care of each one. The alloy also has some good features. It runs very solid and dense, as is the case with any metal that has much shrinkage. And it works very easily in the machine shop and has the appearance of gun metal. It can also be worked hot on the anvil just like a piece of good copper. And I believe it can be forged into most any shape, for I have seen it twisted like an auger.

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* Paper read at meeting of Tri-City Associated Foundry Foremen.

Foundry Machinery–Molding Machines, Flasks, Mills, Etc.

Extract of Report of Committee of Stove Founders' National Defence Association on Foundry Machinery—Descriptions are Here Given of Molding Machines and Patterns, with Costs and Conclusions Arrived At.

(Continued from January Issue.)

Nearly all machines, and certainly all those that would be recommended for use in the stove foundry, are designed to take different patterns, and in many cases a wide range of shapes and sizes. The change from one pattern to another can be effected by those somewhat accustomed to the operation in from a few minutes to an hour. Without doubt it is economy to run the same pattern for not less than a day at a time and change patterns outside of molding hours. Where the double-faced matchplate is used the change is so readily made as to be of itself a matter of no moment. Where changes must be made in molding hours the cost of molding will, of course, be higher.

Some of the items of cost offsetting reduced molding prices are the extra help in handling iron, flasks and sand; cost of making changes of patterns; the depreciation of and repairs to machinery.

On very large floors and where the iron is brought to the floor we find that two hours help of a laborer in shifting weights, strippers and in shaking out is all the help that is required. The cost of repairs to machines and patterns is very slight.

The manner of figuring depreciation on machinery varies so widely that it is deemed sufficient to simply call attention to this item, leaving it to each manufacturer to figure in his own way.

The cost of making patterns for the machine may be varied in accordance with the number of pieces to be made and with the type of machine used. The cost of distributing iron to the floors from the cupola will vary in accordance with the size, layout and facilities of the shop. We found in some foundries the practice of delivering iron to the molders' floors already established and in such cases, of course, this would not form an item of additional cost. The use of the trolley system for carrying iron, where this becomes a separate item of expense to the manufacturer, is recommended.

General Conclusions.

The conclusions formed by the committee after the study of molding machines are in brief as follows:

The stove industry is far behind others in the employment of labor-saving machinery and devices. Molding machines are successfully used in some stove foundries to reduce molding cost.

Those institutions that are making the most use of the machines are also those that are most rapidly adding to their equipment.

All stove patterns can be molded with some form of machine or device already in use.

It is merely a question of the cost of patterns for the machine and the number of pieces to be made whether or not it will pay to mold the piece in question by machine. For bench work the number so required to be made to make machine molding profitable is about 1,000 molds for the more expensive pattern rig and a correspondingly small number for the less expensive rig.

It requires a smaller number of large pieces to be made to pay for new pattern equipment since the saving per piece is larger in proportion to cost of pattern than in the case of small pieces.

Through the use of these practically indestructible pattern plates in place of loose iron patterns, the cost of maintaining patterns in repair is reduced and the necessity of preserving and caring for duplicate sets of patterns in wood or iron obviated.

The best results may be obtained from a system of specialized labor which allows the machine operator to devote himself exclusively to molding and pouring, that is, allows the machine operator to perform only such work besides actual molding which will still make it possible to hold him responsible for good castings. Carrying iron, shifting weights and strippers, shaking out, and if possible, cutting over sand should be performed by common labor. This suggests the employment of surface or overhead carriers as labor-saving devices.

A saving of about 5 per cent. of iron in machine over-hand molded castings seems not unreasonable to expect. An incidental effect on factory economy is suggested by the report of a case where a reduction in the cost of grinding and mounting small cast ranges was secured, after the castings were molded by machinery.

The manner, most apt to be successful, of making molding machine installation, is:

First, determine that you have enough patterns of which the necessary number of molds are to be made to keep a number of machines busy.

Second, see that your organization from manager to machine operator is prepared to back the machine with intelligence, energy and enthusiasm.

Third, select carefully the make of machines best suited to your work. Start with not less than two machines and let all be of the same make; this simplifies matters, gives an opportunity to make competition between operators, and avoids concentrating on one man all adverse criticism of influence.

The increased use of molding machinery will result in increased standardization of parts and reduction in the variety of patterns.

Automatic Polishing Machinery.

We found both eight and ten-arm machines in use, the latter being of more recent design. The ten-arm machines are recommended as having a larger capacity and costing little, if any, more to operate.

The cost of the machine is: Eight-arm, $2,500; ten-arm, $3,000.

The average cost of fallow-boards is reported $1.85 to $4.50.

The number of fallow-boards required depends upon the variety of work to be polished, the maximum number, of course, being required where the variety is greatest, and the number of each piece to be polished smallest. Conversely, the number required is least where the variety is smallest, and the number of each piece to be polished maximum. The machine requires about 15-horse-power to drive it.

Castings to be polished on the machine must be flat or oval. In proportion as a piece is very large or bulging the work of touching up such parts of the area to be polished as are not reached by the machine wheels is increased and the approach to the cost of polishing by hand the nearest. On the other hand, in proportion as the work is flat and finished complete by the machine the work of touching up is reduced and the saving greater. Further, large, heavy work on which a premium is sometimes paid to polishers on account of its size and difficulty of handling, is as easily handled by the machine as small work, and the saving in this class of work is proportionately the greatest. The machines are usually designed to do work running from twenty-

four to thirty inches in width to any length required.

The number of men attendant upon the machine is variously reported from one laborer at $1.50 to $2 per day to two polishers at $4 per day, and part time for the third at $4 per day. The number of men required to touch up work after the machine varies from one to four. They are sometimes journeymen, sometimes apprentices; generally paid by the day but in some cases working piece work. This number will vary with the amount of work turned out by the machine.

The total cost of operation runs from $4.25 to $17.50 per day. These figures include all costs of operation and keeping machine and fallow-boards in repair. The cost of operation, however, is almost entirely labor cost and the largest part of this cost is for touching-up after the machine. We find, therefore, that in cases where the total cost of operation is greatest, the amount of work put through is greatest, and the savings both in amount and in percentage of hand-polishing prices are greatest.

In round numbers the output of the machine varies from two hundred to four hundred pieces per day and from $7 to $43 in terms of hand-polishing prices. The corresponding daily savings over hand-polishing are $3 to $26. The percentage reduction from hand-polishing cost runs from about twenty-five to eighty.

Facing Machine.

The committee encountered an interesting machine by means of which better and cheaper work can be done in fitting oak doors, facing registers, etc. This machine is a home-made affair, consisting of a stand and bearings supporting a vertical spindle on the upper end of which is mounted a large cast iron disc with machined face. The face of the disc is set up with coarse emery cloth.

The door or piece to be fitted is laid upon the face of the disc, where it is held in place by a frame work built over the face of the disc, while the disc is rapidly revolving. After being faced in this manner little work remains to be done in order to make a tight-fitting door. With this machine one man is able to fit as many base doors as three men without the help of the machine and by the method generally in vogue.

Polishing Mills.

Two different types of polishing mills were found in use; one in the form of a cylindrical drum with cast iron trunions; the other oval in shape, made entirely of cast iron and hung from accentrically-placed trunions. Good results were secured with both.

The majority of the users of the water mill make only a limited use of the mill to polish the smallest and lightest castings. Others who have made a special study of the use of the mill have succeeded in successfully polishing in it much larger parts, up to 7x14 ins. Parts which have an unbroken plain surface are successfully polished up to 2x6 ins. in size. Where part of the piece is background work with comparatively little plain surface, pieces of the size mentioned, namely, 7x14 ins., are successfully treated. It may be that better results are obtained of which we have no information, at all events these are definite figures given the committee and as far as the size only is concerned there is no reason why a large proportion of our stove plate may not be polished to advantage in this manner. Some of the work polished in mills are: handles, shakers, cranks, registers, keys, knobs, urns, small feet, drop shelves, registers, ash guards, base strips, base burner legs and over door panels.

The weight of castings that may be charged into the mills depends upon its size, method of working, and character and amount of material charged with the castings. Examples are: 150 lbs. in a 15x22-in. oval mill; 1,000 lbs. in a 20x30-in. cylindrical mill; 250 lbs. in a 22x60-in. cylindrical mill. The daily output per mill runs from 50 to 250 lbs. The time of running a mill varies from two to seven days.

The materials used as abrasive agents in the mills are sandstone, emery, sharp sand, granite, cast iron stars, limestone or marble chippings, or several of these materials in combination with water added. Sandstone seems to give the best results, though a charge of 15 to 20 pounds of granite, 10 pounds of cast iron stars with 500 to 700 pounds of casings, used in one plant regarded as having the most advanced practive, gives good results.

For small work and work having comparatively little plain surface, no other polishing than that done by the mill is required where the requirements are not exacting. The finish, however, is not equal to hand work and where the best finish is required the work requires finishing on an oil wheel. In some cases the work is oiled and colored.

The cost of mills is variously given from $20 for a home-made 18x40-in. cylindrical mill to $200 for 22x60-in- cylindrical mill, also home-made. The cost of cast iron oval mills, 2x4-ft., is reported to be $100.

The cost of power, breakage and materials, is reported at one-twentieth of a cent ($.0005) per pound. This seems too small a figure and it would be safer to figure it to cover merely the breakage and cost of materials.

The cost of power, figuring one-horse power for a mill carrying four hundred pounds of castings, running forty hours, would be fifteen-hundredths of a cent ($.0015) with power at one cent per kilowatt hour.

The cost of power, breakage and materials together are more conservatively estimated at two-tenths of a cent ($.002) per pound.

The cost of labor for operating mills is reported variously from one-twentieth of a cent ($.0005), to nearly two-tenths of a cent ($.002) per pound, the variation being due to differences in machinery, method and character of work, as well as the rate and pay.

The cost of polishing labor for finishing after milling is from two-thirds of a cent ($.0066 2-3) per pound to $.01 1-2 per pound, or from twenty-five to fifty per cent. of the polishing price. Where the polishing price is for four or five-wheel work, twenty-five per cent. should be quite enough to pay for the finishing on one oil wheel. This may be safely said in view of the fact that the high figure is reported in one case only. In one case the practice is to rough out before milling. This costs from eight to twenty-one per cent. of the polishing price. Oiling and coloring after milling in one case is reported as costing 28 per cent. of the polishing price.

One case is reported of a mill charged with 250 pounds of castings, running 40 hours, and taking two and three-quarters hours to load, which only netted a saving of $1.43 for a load, or about 6-100 of a cent ($.0006) per pound. This is the net saving after deducting all costs and is for castings that have to be highly finished. This example shows the lowest rate of saving reported and does not represent the average, which is much more favorable.

The items of cost per pound of mill polishing compiled from answers to our inquiries is tabulated here:

Materials and breakage	$.0005	to	$.0005
Power	.0015	to	.0015
Mill labor	.0005	to	.0020
Polishing labor (finishing)	.0007	to	.0150
Polishing labor to finish same work entirely by hand	.0240	to	.0500

Polishing is also done in such mills by the dry process. Having, however, no information concerning the details of the process, we can do nothing more than simply call attention to its use. Likewise we find that such mills are also used for buffing after plating. Concerning buffing we, likewise, have no data which would be valuable and simply call attention to the use of what may be another valuable labor-saving device.

How the Apprentice Got Even With the "Smart" Mechanic

Experiences of an Apprentice when Learning his Trade, Showing What he was "Up Against" and how he Overcame his First Difficulties.

By THE APPRENTICE

They say that "All work and no play makes Jack a dull boy," and I guess it applies to mechanics as well as to schoolboys. Anyway that was the way it appeared to me when I entered on my duties as an apprentice. It was a timid enough chap that approached the foreman one Friday afternoon and asked for work, but when he said, "Come to work Monday morning," I was the most important chap in town. At least that was how I felt. I strutted around town and looked down on my school chums as far beneath me. But my awakening was to come. I didn't know what was before me or I should have been a little more reticent. By seven o'clock Monday morning the timid air had completely vanished and with a head swelled to twice its normal capacity and a new clean set of smock and overalls, I approached the foreman. Before many hours were over I realized there was something to learn. Of course I made a darn fool of myself, but I got the bumptiousness knocked out of my noddle.

The fun wasn't all on one side however, and I laugh yet when I think of the time I gave the shop "smart Alex" a few "shocks," but I will tell of them later.

My first job was threading some bolts on an old lathe that must have been invented when Noah was building the ark. However, it worked, but that is all that can be said. The efficiency of the machine must have been about 5 per cent. The machine was situated in a corner of the shop known as "devils' corner." I soon learned what that meant.

After working steadily for an hour I ran out of material and looked around to get a wheeler to bring a load of bolts. When my back was turned the fellow on the bench nearest me, Bill, loosened the die in the socket, and when I came back after getting a wheeler the die was wabbling like a sick hen.

I asked Bill what the matter was. He approached the old lathe and looked so serious I thought the machine was done for. He said he could fix it if I would go into the forge shop and get the trip hammer. I couldn't find the boss and asked a fellow there, and he said to get a truck and he would show me where it was.

I came back to the machine shop and the first person I ran into was my own boss. He wanted to know what I was running around for and said that I must stay at my machine. I told him what I was after and in his gruffest voice he ordered me back to my lathe. I was sure Bill wouldn't like it if I didn't get that hammer so, as the boss went to an upper flat on the elevator, I got a truck and went after the important trip hammer. When I went to the forge shop the fellow said the hammer had just been taken to the carpenter shop. I came back with the truck and took the elevator to the carpenter shop. When I was stepping off the elevator, I ran into the boss again and was sent back to my machine in a hurry. When I got back they all laughed and when I told them about running into the boss they roared. I noticed that my machine was running alright again so went to work and said nothing. At one o'clock I hunted up the forge shop boss and asked to see the trip hammer. Then I saw the joke.

I got back at Bill for that though. Bill used to fix the electric lights. That is, he used to put in new carbons every day and do any wiring necessary. He used an iron pail to wash in and I knew enough about electricity to know the iron and water were good conductors. Tuesday evening Bill filled the pail as usual and when he was taking a look around the shop I attached wires to the pail. He came back, and in about five minutes to six prepared to wash-up. He got out his soap and leaned over the pail, but he didn't get much farther and the joke was on him.

The Apprentice Gets Even with Bill by Attaching a Wire to the "Soup" Pan and Belt.

One day shortly after we were sitting around a few minutes before one, when Bill proposed that I take a chew of tobacco. I rebelled at first but was jollied into it. Gosh! I've never touched it since. I went out into the castings department and crept into a bin. I was good and sick. I have heard of green apples and buttermilk and ocean trips, but I am sure they couldn't hold a candle to this. I no longer wanted to be a mechanic, but I stuck at it and resolved to pay Bill back.

My opportunity came before very long. Bill was turning some shafts on a lathe one day and had underneath a large pan to catch the "soup" as it dripped down from the tool. I was back early at one and noticed the pan half filled with "soup." I saw that this was my opportunity to "get even" with Bill. I got a piece of wire and attached it to the back of the pan and the belt. Bill never noticed the wire and he started up the lathe. He noticed it then, but I was sorry for him afterwards for he had to spend the whole afternoon in the shop with wet feet.

I learned that the best way to take anything was with a grin, but as sure as Bill fooled me I got back at him and before I was there very long Bill and I were the best of friends.

My next fool trip was to the foundry to bring in a cupola. I got it—yes—where I deserved it. The foundry foreman was a gruff old fellow and kicked me out. I resolved that Bill would be punished for it and I laid plans accordingly. The fellow on one of the screw turret machines was away one day and Bill was running it. During the day he had to leave it to fix the lights and when he returned I had electric wires attached to the machine. There was no current, however, until late in the afternoon when the lights were turned on. When they were, Bill had an awakening, for he found he couldn't leave his machine. A fellow near broke the circuit by pulling the wires off the machine with his hammer. Bill was going to kick me out for it, but decided I wasn't to be fooled with after that and sent me on no more fool errands.

I had seen enough, however, to take away the bumptiousness and found there were many things to learn before I could call myself a mechanic. I'm still learning and hope some day to get my papers.

Reorganization of the Lake Superior Corporation

British Capitalists Purchase Securities of Holding Co. Liabilities to Banks are Liquidated. Additional Capital to be Brought in.

An important epoch has been reached in the affairs of the Lake Superior Corporation of Sault Ste. Marie. Ever since the Corporation was started it has had many difficulties to contend with. Some of these were of its own making. One of its chief difficulties at the start was the fact that like similar industries in new countries, its original cost was excessive. This was a serious handicap.

About five years ago a crisis was averted by the Government of the Province of Ontario guaranteeing a loan of two million dollars. Just about the same time there was also a complete reorganization of the corporation's executive officers, and a holding corporation, The Canadian Improvement Company, was formed to take care of the assets.

When the new executive took control it was found necessary to purchase some $2,500,000 worth of raw material while of funds available it had scarcely half a million dollars.

British Capitalists Invest.

Now the securities of the Lake Superior Corporation have been secured by a group of capitalists, chief of whom is Robert Fleming, of London and Edinburgh, a gentleman whose name stands high in the financial world. Associated with Mr. Fleming is F. S. Pearson the engineer of London and New York, who will take a prominent part in the direction of the undertaking. He is already interested in the Canadian iron and steel industry, being a director of the Dominion Iron & Steel Co. and of the Dominion Coal Co.

The process of reorganization is being proceeded with, and will soon be completed. In the meantime the liquidating of the corporations liabilities has been accomplished. It was stated by one of the executive officers of the corporation that on Tuesday, January 12th, the last dollar owing the banks had been paid off, including loan guaranteed by the Ontario Government, $1,000,000 of which was paid off some time ago. Eighteen months ago its liability to the banks aggregated about $2,500,000.

The next move of President Warren and the directors is to secure additional capital to extend and improve the various plants of the corporation and to complete the construction of the Algoma and Hudson Bay Railway. Grading on this road is practically finished.

The Officers of the company are: President, Chas. D. Warren; 1st Vice President, J. Tatnall Lea; 2nd Vice-President, Thomas J. Drummond; Treasurer and Secretary, Walter P. Faust.

The capital stock authorized and outstanding is $40,000,000; first mortgage bonds authorized, $10,000,000; outstanding about $9,000,000; income bonds authorized and outstanding $3,000,000.

Thirteen Subsidiary Companies.

The subsidiary companies owned and operated by the Lake Superior Company number thirteen. They are: Algoma Central & Hudson Bay Railway Company, Manitoulin & North Shore Railway Company, Algoma Commercial Company, Limited, Algoma Iron Works, British-American Express Company, Algoma Steel Company, Limited, Lake Superior Power Company, International Transit Company, Trans-St. Mary's Traction Company, Tagoma Water & Light Company, Sault Ste. Marie Pulp & Paper Company, Michigan Lake Superior Power Company, Lake Superior Iron & Steel Company, Limited

According to the report of the directors, presented at the annual meeting in October, 1908, the operations of the various subsidiary companies during the preceding fiscal year showed a net surplus of $1,072,000, an increase of $214,870 over the previous year, and this in spite of the fact that the steel plant had been closed down for a considerable time.

Two Blast Furnaces.

The Algoma Steel Co., one of the subsidiary concerns of the corporation operates two blast furnaces, each of a capacity of 250 tons of pig iron per day. Since the steel works were established these furnaces have been unequal to the demands made upon them and an increase in the capacity of these furnaces to 500 tons per day is necessary for their own requirements.

The Bessemer plant consists of two convertors of four tons capacity each. The rail mill which is the first started in Canada consists of three stands of rolls. The plant is laid out with a view to handling rails from 30 to 60 feet in length and of eights up to 100 lbs per yard.

In addition to the Bessemer convertors there are two basic open-hearth furnaces each of a total capacity of 400 tons. The capacity of the blooming and rail mill is 600 tons per day.

The output of pig iron by the Algoma Steel Co. during the last three years was: 1905, 66,235 tons; 1906, 130,902 tons; 1907, 135,852 tons. The output of standard steel rails was: 1905, 98,822 tons; 1906, 159,740 tons; 1907, 142,958 tons.

The open hearth furnaces started by the Lake Superior Iron & Steel Co. last year produced 25,321 tons of open hearth rails.

INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News.

Foundry and Machine Shop Notes.

Ernest Sneider has established a foundry at Morden, Man.

The Defiance Iron Works, Chatham, recently added 15 men to their staff.

The Grand Trunk car shops at London have re-opened with 460 men on the pay roll.

The by-law to loan $20,000 to the Standard Implement Co. was defeated in St. Thomas.

The Hydraulic Manufacturing Co., of Seattle, have opened a water pipe making plant in Victoria.

Philadelphia interests are said to be urging the Polson Co. to double its ship-building yards at Toronto.

The foundry of the McClary Manufacturing Co., London, has now a staff of 430 men at work on full time.

The White Sewing Machine Company, Cleveland, is considering locating its Canadian branch in Hamilton.

The Silliker Car Co., Halifax, has added a brass furnace and brass molding equipment to their extensive plant.

New machinery was recently installed in the Wallaceburg Brass Works for the manufacture of metal rings for gem sealers.

It is understood that the Union Drawn Steel Co., Hamilton, is negotiating for the erection of a large steel plant in Buffalo.

After being closed down for over a year, the American Abell Engine and Thresher Company's molding shop, Toronto, has resumed.

W. W. Butler, of the Dominion Car & Foundry Co., Montreal, says that steel passenger cars will soon come into use in Canada.

Again there is talk of John W. Gates building a big steel plant at Toronto or some other place in Ontario to utilize Moose Mountain ore.

Fleming & Roys have opened up a machine shop at 119 Simcoe Street, Toronto. They will make a specialty of automobile repairing and marine motor work.

The engineering works of M. W. Cunliffe, of Rossland, were partially destroyed by fire, which broke out shortly after closing time. The estimated loss is $10,000.

There is a probability of the Dominion Iron & Steel Co., at Sydney, C.B., enlarging its operations by manufacturing lime and the various by-products of its iron plant.

The Vulcan Company, which some time ago purchased the plant of the William Malloch Co., London, intends going into the manufacture of furnaces, stoves, elevators, etc.

The Victoria, B.C., Machinery Depot are adding the newest and most up-to-date patterns of labor-saving machines to their plant to replace those destroyed by fire last year.

Goldie & McCulloch's big factories in Galt are in full swing with many orders ahead. McGregor & Gourlay, in the same town, are also busy and have put on a night shift.

The Goold, Shapley & Muir Co., and the Verity Plow Co., Brantford, have started on full time, and the Cockshutt Plow Co. will run each evening until nine o'clock.

The Amherst Foundry Company, Amherst, N. S., is working to its fullest capacity and large orders from the upper provinces and the west are being filled as rapidly as possible.

The firm of Foley & Williams, of Chicago, manufacturers of the Goderich sewing machine, are soon to open a Canadian branch in Guelph, making that city their headquarters for the Dominion.

Webb & Scott have opened a machine shop at the rear of 12 Keele Street, West Toronto. Besides doing a general automobile and gas engine repair business, they will build special machinery.

The warehouse of the Buck Stove Co., Brantford, occupied by the Hampel Box Co., was burned out last week. New machinery will be ordered, and the firm will recommence work as soon as possible.

The plant of Clark-Demill Co., Hespeler, Ont., has been sold to the Hespeler Machinery Co., a new concern, of which George D. Forbes is president, and W. G. Chater secretary-treasurer and managing director.

The Massey-Harris Co. has increased its capital stock by $2,000,000, making the entire capital $10,000,000. The company has a full staff of men, not only at the Toronto works, but also at Woodstock and Brantford.

The Chatham Malleable Iron and Steel Co., Chatham, Ont., report a most successful season for their output of handsleighs and cutters. They expect to construct a new factory in the course of a few months.

Certain parties in London are considering taking over the Mann Brass Works, which went into liquidation some time ago. There should be a good thing in this for any one desirous of going into special lines of manufacture.

C. Richard & Co., 20 St. George Street, Montreal, machinists, etc., have secured a new and larger site for their business. They will make many improvements to the buildings already on the land and intend to move in early in the spring.

The Nova Scotia Steel & Coal Company have just closed a very successful year's business, and the outlook is promising for the coming year's business. The company is looking forward to considerable expansion of its trade in both steel and coal during 1909.

E. Housey, 5 Bathurst Street, Toronto, is putting up an addition that will more than double the capacity of his present plant. Besides continuing to manufacture gasolene engines, he will build a complete line of motor boats, for both speed and pleasure.

The big foundries and factories are increasing their pay rolls in consequence of the rush of orders for iron goods. Managers of every important concern in Toronto anticipate a very busy season, and expect to have their shops running to the fullest capacity in a few weeks.

One hundred and thirty-five men have been added to the staff of the Rolling Mills, at Belleville, the 9-in. and 18-in. resuming operations with full staff. The companies have orders ahead to keep them going for several months, getting out bar iron and horseshoes, the latter department being in full swing.

The Forest Brass Works, Brantford, have received orders for five times the capacity of the present plant. In order to meet the demand it is proposed to increase the capital stock by organizing a joint stock company, with an additional capital of $10,000, much of which is already subscribed.

The Rhodes-Curry Car Works, of Amherst, N. S., have a year's work on hand and their extensive plant will be operated to its fullest capacity. The Dominion Coal Company intend to increase their output next year, and the Dominion Steel Company have several large orders on hand for rails.

One of the busiest concerns in Hamilton is the Chadwick Brothers' brass manufacturing works. It is working night and day, and will erect an addition. One of the biggest contracts is an order for automobile lamps and brass work for such machines for the McLaughlin-Buick Company, of Oshawa.

Among the charters announced this week is one to the Canadian Road Machine Company, of Hamilton. The provisional directors are Robert Mancill, Chester Walters and William Bell. The share capital of the company is $60,000. The company will manufacture, buy, sell and deal in road machinery.

The Dominion Iron & Steel Co. have closed a very busy year. The gross earnings for 1908 were $2,613,815.66, and the production for the past year was: Ore mined, 556,000 tons; pig iron made, 262,000 tons; steel made, 277,000 tons; rails made, 153,500 tons; wire rods made, 42,000 tons; other steel products, 35,000 tons; sulphate ammonia, 8,000 tons; tar, 4,500,000 gallons.

G. Walter Green, of Peterboro, who has been operating a foundry and machine works that has grown rapidly during the past few years, has received a chacter for his business, which will be known in future as the G. Walter Green Co., capitalized at $100,000, with new officers. They will continue to manufacture mill machinery of all kinds, steam engines, wood and iron pumps, etc.

The Canadian Brass Company, Galt, is doing big things with a large quantity of Chinese coin recently imported from China. The brass is of exceptional good quality and can be put to many uses. Several sample candlesticks turned out have attracted a great deal of attention. They are of massive design and ornamented about the base with the real coins nicely polished.

Negotiations at present under way will probably secure for Galt an industry known as the Champion Potato Machinery Co., of Hammond, Ind. Otto Kloenzer is president of the company, which is about to establish a branch in Canada. The firm manufacture potato cultivating machinery and other farm implements. In all probability the building and machinery of the defunct McVicker Engine Company will be taken over.

Fire gutted the foundry department of the Rossland, B.C., Engineering Works, burning a good many patterns and injuring the machine department, with a loss of about $10,000. The brigade had a hard fight for an hour and a quarter, contending with the extreme cold. The water freezing on the machinery prevented the fire from warping it. Wm. Cunliffe, the owner, says he will resume operations as soon as the damage can be repaired.

There is just a probability that the Edge Tool Factory, Galt, recently declared insolvent, will be started again under new management. The officers of the old company are still in charge and are disposing of the manufactured stock. The company turned out an excellent line of goods, were well equipped with machinery and did a good trade, but lack of capital appears to have been the difficulty. It is an excellent opportunity for the proper persons.

The Louden Machinery Co., Guelph, are moving into their fine new premises and their old plant, the drill sheds, will be occupied by the Louden Manufacturing Co., manufacturers of all kinds of potato machinery. In addition to this the Raymond Manufacturing Co. have succeeded in completing arrangements with the Foley, Williams Company, of Chicago, to manufacture all their Gooderich machines for the Canadian, Newfoundland, Australian and New Zealand trade.

The Manitoba Iron Works, Winnipeg, are making an addition to their already extensive plant, by adding a structure 450x130, so that the concern will be able to take care of any structural steel contracts of any size. The cost of the addition will be $150,000. When the addition is completed the capacity of the Manitoba Iron Works will be in the neighborhood of 20,000 tons of steel per year, and bridge work of the largest kind can be handled. This concern employs over 200 men, and when the erection of this new portion is completed their staff will be increased to 400.

Municipal Enterprises.

Burlington carried a by-law in favor of a waterworks system.

Almonte carried a by-law to raise $15,000 for street improvements.

Hamilton carried a by-law to expend $75,000 on the extension of sewers.

The by-law to expend $3,000 on waterworks extension was defeated in Port Elgin.

Renfrew ratepayers have approved a by-law to expend $5,000 upon sewer extensions.

A gas plant for Fort William is again being brought to the front by the city council.

The ratepayers of Stratford have carried a by-law to spend $25,000 on sewage disposal works.

The ratepayers of St. Thomas have approved a by-law to raise $40,000 for septic tanks for city sewage.

The by-law to provide for the cost of a new filtering basin for the Meaford waterworks has been carried.

A new sedimentation basin built under the supervision of Willis Chipman is now in use by Saskatoon.

An agitation is on foot to obtain a water supply for Richmond Hill, Ont., from the nearby elevation of the Ridges.

The Ontario Railway and Municipal Board have approved a by-law to raise $28,000 for sewer construction at Fort Frances.

A. F. Macallum and T. Aird Murray, consulting engineers, Toronto, are preparing plans for the instalation of the proposed sewerage system in New Toronto.

An ammonia plant is the latest civic revenue producer in St. Thomas. The 6,000 tons of coal carbonized yearly at the works will produce about 18,000 pounds of ammonia, giving the department a revenue of $900 yearly on an investment of $2,000.

Within a few days the mains of the Seymour Creek water system will be connected with the Vancouver city system and the available water supply of Vancouver will, by that action, be doubled, giving a service in the field capable of meeting the needs of 180,000 people.

The Montreal Locomotive Works have received orders during the last few days for 55 engines. The C.P.R. has ordered 30 engines of the standard Pacific type with 21 by 20-inch cylinders, 69-inch drivers, and a light weight, including tender, of 215,000 pounds. The G.T.P. has ordered 25 locomotives with 18 by 24-inch cylinders, 69-inch drivers, of the standard eight-wheel type of the "440" class, the total weight being 121,000 pounds. Delivery of these orders will be made in May.

City Engineer Edington, of Moncton, N. B., has just presented a complete report of the water and light committee as to the advisability of increasing the city's water supply. The plans submitted would entail an approximate expenditure of $217,000, made up as follows:— Embankment, including gate house, wasteway, etc., $87,000; 20-inch leading main, $87,400; cleaning bed of reservoir, $5,500; diversion of Alexander Road, $1,200; land and damages, $5,000; contingencies, $6,000; total, $192,100; pumping station, $25,000, making a grand total of $217,100.

At the meeting of the Vancouver Board of Works a letter was received from the Decarie Incinerator Company, offering to put in one of their 40-ton destructors, or to take over the present incinerator and work it on their plan. It is the intention of the city to instal another incinerator. There was some discussion over the letter. Ald. McMillan moved that it be filed, as the Decarie incinerator had been a failure in Winnipeg, and there was no use, anyway, in changing the present satisfactory system here for an unsatisfactory one. As the Decarie Company invited inspection of their plant at Spokane, Wash., an amendment was moved that the offer be accepted if the expenses of aldermen and accompanying newspapermen were paid. This motion was defeated by the casting vote of the chairman.

Railway Construction.

The Railway Commission has ordered a viaduct for Toronto.

The C.N.R. have decided at last to build the line between Port Arthur and Sudbury.

The Delaware & Hudson propose running a branch into Sherbrooke from its Montreal line.

The Sydney-East Bay Electric Tram Railway will build seventeen miles of road this year.

The G.T.P. will run regular through trains between Winnipeg and Edmonton in the spring.

The Canadian Northern will construct a line from Macleod to the Great Northern Railway at the Montana border.

The Prince Albert & Hudson's Bay Railway is applying for permission to construct a line from Prince Albert to York Factory.

The construction of the first hundred miles east of Prince Rupert is being pushed and will be ready September 1.

Fort William is asking the Provincial Legislature to sanction a debenture by-law for $170,000 for the extension of the street railway system.

The Canadian Northern and the G.T.P. will build 700 miles of road in Saskatchewan this year, the Provincial Government guaranteeing $13,000 per mile.

The Eastern Ontario Counties Electric Belt Line Railway propose to connect Cornwall, Brockville, Morrisburg, Winchester and Ottawa with a line this year.

An electric railway is proposed to be built between Cobourg and the Kawartha Lakes, and another from Cobourg to Havelock. Each line will be 30 miles long.

The T. & N. O. propose tapping the Elk Lake and Gowganda districts by a branch line this spring. The C.N.O. and C.P.R. also will build lines there this spring.

The spending of a large amount of money on improving and extending the Algoma Central is said to be the intention of those behind the Lake Superior corporation.

The C. P. R. expect to spend $30,000,000 on western lines this year. The Moose Jaw-Lacombe, Sheho-Lanigan, Wilkie-Battle River, Lethbridge-Macleod, and Mowbray extensions will be pushed.

Track-laying will be commenced immediately by the Great Northern at Keremeos, B.C., as well as on the Spokane-Portland line. Grading is being done by the same road between Allison and Princeton.

Malcolm McPherson, Freelton, Ont., has been appointed by John Patterson, Hamilton, to buy the right-of-way from Freelton to Guelph for the projected electric road of the Hamilton & Guelph Railway, of which Mr. Patterson is the promoter.

The St. Mary's & Western Ontario Railway is applying for permission to construct lines from Woodstock to Brantford; St. Mary's to Stratford; St. Mary's and Exeter branch to Guelph, and Goderich branch, and from Exeter to Grand Bend.

Railway surveyors have been working along the line of the Kootenay Central last summer, between Golden on the main line of the Canadian Pacific Railway and Galoway, on the Crow's Nest branch a few miles west of Fernie. This line will be completed this year.

The C.N.R. has applied to Parliament for permission to construct lines from Nepigon Bay to the N.T.R., from a point on the Montreal-French River branch to a point on the Hutton branch; from a point on the Sudbury-Port Arthur line to the N.T.R. at Abitibi River; from the C.N.O. line into the Temiscamingue country. The railway also asks for an extension of time on various other lines projected in Ontario.

A report from Calgary states that a progressive campaign of railway building in Southern Alberta is being arranged for the present year. A party of surveyors is now working in the vicinity of Pincher Creek and the lines proposed will keep them busy for three months. In connection with the roads which are to run northeast from Calgary to Saskatoon and other points in the Saskatchewan Valley, the amount mentioned for the guarantee of bonds is $10,000 per mile.

The present session of the B.C. Legislature will see some important applications for charters for railways in different parts of the province. Behind the application for a railway between Skidegate and Rennel Sound, on Graham Island, one of the Queen Charlotte group, lies the story of a large enterprise. Leigh Hunt, formerly of Seattle, who made a fortune in Corea, and an English capitalist, have formed a company with a capitalization of $10,000,000 to take over 27,000 acres of coal lands on Graham Island from a Victoria syndicate, and development will be commenced. A fleet of colliers will be established and the operations carried out on a large scale, with the object of supplying the northern coast.

Electrical Notes.

Tenders will be received until March 1st, 1909, for a municipal power plant at Lethbridge.

The ratepayers of Galt have approved a by-law to raise $12,000 for electric light extensions.

The by-law to provide $12,000 for the Barrie electric light department carried by a big majority.

The Smith's Falls Electric Power Co. is installing meters on its whole system of house lighting.

Winnipeg has declared for a municipal power plant and work will be commenced at once on a plant on the Winnipeg river.

The Electric Service Co. is submitting a new draft by-law to the Montreal council with regard to the supply of electricity.

Eight money by-laws for various works, including $25,000 for further power development on the Current river carried in Port Arthur.

It is expected that in about a month's time Toronto will be calling for tenders for underground cable for the down-town electric distributing plant.

The request of the Electric Company for an extension of time in which to continue boring for gas under their contract with Lethbridge has been refused.

The Moncton Electric Street Railway, Heat and Power Co. is applying to increase its capital to $195,000, and is seeking permission to borrow $200,000 to extend its system.

The construction of the B.C. Electric line will be a good thing for the Chilliwack valley. The pumping out of Sumas lake will reclaim a large area of land and the company will develop their immense power.

The large dam which the Vancouver Power Company proposes erecting at the outlet of Coquitlam lake is exciting considerable interest in Vancouver, as well as in the Municipality of Coquitlam.

Delegates representing the Coquitlam and New Westminster councils, as well as from the Board of Trade, strenuously oppose the application of the company for permission to build the dam.

The annual report of the Ottawa civic electric plant shows that the year's operations have been very successfully conducted. The gross revenue was $105,000 and the net profit $15,000, after providing for interest and sinking fund.

The Ontario & Michigan Power Company will seek incorporation to acquire and operate water power on the Pigeon river and the Nepigon river, for the construction of necessary buildings and for the building of electrical and hydraulic works.

K. L. Aitken, chief engineer in charge of the Toronto electric distribution plant, has been appointed by City Engineer Rust engineer in charge of the East Toronto electric light plant. East Toronto's plant has a capacity of 200 h. p. There are 40 arc lights and 132 incandescent lights in the streets, and 100 customers for the electric light.

John Gunn & Sons, Winnipeg, have the contract at $779,100 for the general works at Point du Bois, in connection with Winnipeg's power scheme. The Northern Aluminum Co., Shawinigan Falls, has the transmission line aluminum cable contract at $148,050, and the steel towers contract goes to the Manitoba Iron Works, of Winnipeg, at $87,500.

Halifax county council after some discussion decided to guarantee the bonds of the Halifax and Suburban Electric Company, to the amount of half a million dollars. Parties interested in the Waverley gold mine are ready to furnish the capital for utilizing the Fall River water power and transmitting to Halifax via Dartmouth and Bedford for manufacturing and other purposes.

James D. Schuyler, of Los Angeles, has advised the British Columbia Electric Railway Company to undertake at the mouth of Lake Coquitlam the construction of a dam 75 feet high. This will create a greatly increased supply, which will flow through the hydraulic tunnel to Lake Buntzen, there being delivered to the pipes which carry it to the generating station on the North Arm of the inlet. This scheme is now being laid before the Provincial Government.

The wheels for the municipal power house at Bobcaygeon have arrived. The wheels, which were manufactured by the Madison Williams Foundry Co., Lindsay, are of the Triumph turbine type, and each is capable of developing 80 horse-power with a five-foot head, and about 100 horse-power with a six-foot head, the two weighing over fourteen tons. The dynamo and other apparatus has already been transferred to the new power house and the poles have been changed, so that the wheels and line shaft are now the only things to be fixed.

The Ontario Power Company are preparing plans for the construction of a new pipe line to increase their capacity of electric power by 65,000 horse-power, and work will be commenced early in the spring. The work is made necessary to handle the contract with the Hydro-Electric Commission. The tunnel will be of steel, lined with concrete, and will be 30 feet in diameter and about a mile in length. The work will cost over three-quarters of a million dollars. With the new line the company will be able to develop 180,000 horse-power.

A year ago the ratepayers of London voted the sum of $235,000 for the purpose of establishing a distributing plant for Niagara power, but as yet no steps have been taken looking to construction of the service. As, however, it is promised that the power will be delivered at the city's gates by December next and London has contracted for 5,000 horse-power per day, it is thought to be time the aldermen were doing something. The London Electric Company is willing to sell to the city, and the aldermen will ascertain what the London Electric is willing to sell for.

The special committee of the Montreal city council, which has been investigating the matter, has recommended that the city purchase the Water & Power Company. The latter want four and a half millions for their property, but the price will be fixed by arbitration. Speaking of the action of the council in notifying the Light, Heat & Power Company to continue the lighting of the streets, and that the city would be responsible for the cost, Mayor Payette said, "Council has pursued the proper course in this connection. The next move council must make is to decide what will be the future policy for the lighting of the streets." He advocates a municipal plant.

A big power scheme is now being considered by Edmonton. It is proposed to use the water power at Grand Rapids on the Athabasca river, 150 miles northwest of the city, to generate electricity for the use of the city. At Grand Rapids there is a fall in the water of 140 feet

in a distance of 600 feet. Here could be obtained electric power to the extent of 250,000 horse-power, which would meet the needs of Edmonton, Strathcona, Fort Saskatchewan, Leduc, Wetaskiwin and other towns. At the present time the above mentioned towns use 15,000 horse-power. It is estimated that it would cost $1,500 a mile to build a conducting line for the 150 miles.

The chief engineers of the Public Works, Marine and Canals Departments, who were asked by the Government to report on the project of an American company to develop power on the St. Lawrence river, near Cornwall, by damming the Long Sault Rapids, have reported that the plans as submitted by the company would need considerable modification before they could be entertained by the Canadian Government. The report states that the privileges asked for should not be granted unless it is made absolutely sure that the project will involve no interference with navigation, and the present canal system. The company have secured rights on the New York side of the river.

The Stave Lake Power Company, Vancouver, has been carrying on extensive operations at Stave lake at an expenditure of $400,000 to $500,000. Active construction had gone on up to the last half year and since then the management has been completing financial arrangements and making surveys for power lines into Vancouver. The route of the power line has been determined and the company holds a franchise which will enable it to supply power to industries all around Vancouver at a cheap rate, which will also apply to domestic and public power. The idea of associating with the Burrard, Westminster, Boundary road and V. W. & Y. is to utilize the charters held by these corporations to build lines into the adjacent municipalities.

In a score of municipalities in Ontario on election day by-laws were voted upon in connection with the Ontario Government power scheme. In all but two places—Brantford and Kingsville—the verdict of the ratepayers was favorable, which means that the scheme of Hon. Adam Beck will have to be extended and the operation of the Hydro-Electric Commission enlarged as far as Detroit and the St. Clair river. The work of the Niagara Falls Power Commission is evidently appreciated by the people. The places in which the by-law carried are: Amherstburg, Bothwell, Chatham, Comber, Dresden, Dundas, Elmira, Essex, Glencoe, Leamington, Norwich, Port Stanley, Ridgetown, Sandwich, Simcoe, Stratford, Tilbury, Tillsonburg, Walkerville, West Lorne, Windsor.

A. G. Perry, manager of the B. C. Electric Railway Co., has outlined the plans of his company in regard to the efforts to be made to avoid trouble in the future at Vancouver. The plans call for the erection of stronger masts at the Second Narrows and the staying of these masts by double steel guys; the strengthening of the piles around the masts and the general fixing of the lines across the Narrows. The company intends to rebuild the transmission lines in the municipality, carrying them up Lynn creek instead of across the creek, thus avoiding the danger of the poles across the creek being washed away again. This work will be started within a month and rushed to completion. New transformers will be installed in the sub-station, and also a new transformer giving double power to the street lighting system.

Negotiations between Winnipeg and the street railway came to an abrupt and somewhat unsatisfactory ending. Mr. Mann presented the final offering of the company regarding prices for power and commercial lighting, and his alternative for the sale of the enterprises to the city on a basis to be fixed by arbitration, but the council decided to reject these and proceed at once with the erection of a civic power plant on the Winnipeg river. Council, however, declared its readiness to treat with the company as to a basis on which an actual purchase may be effected. Included with the offer of a supply of electric energy for manufacturing purposes, the company declared its readiness to cut rates for commercial lighting 20 per cent., provided a contract for ten years was entered into and work on the municipal plant was deferred.

The construction of the Ontario Hydro-Electric line will be started as soon as the weather permits, according to F. H. McGuigan the contractor, if material is in readiness. Three-quarters of the right-of-way to the west has been secured, and the laying of the footings will commence in March. Some five miles of footings, each sixteen feet square, will be laid prior to putting up the first towers. The route is highly satisfactory to the contractor. "With the exception of the valley between Waterdown and Dundas," said Mr. McGuigan, "it would be difficult to find better country anywhere for our purpose." The Hydro-Electric Commission visited Walkerville to inspect the sample towers for use on the power transmission line which are being manufactured at the border town. The towers are 60 feet high and built to stand the severest weather tests.

Structural Steel.

Saskatoon and the Canadian Northern Railway will build a foot bridge over the tracks on 20th Street.

The Canada Foundry Co., Toronto, recently received a contract for some bridges on the G. T.P. in New Brunswick.

The ratepayers of Toronto have carried a by-law to provide $250,000 for the construction of the Wilton Avenue bridge.

The Strathcona city council have instructed City Engineer McLean to prepare plans for a high level bridge over Mill Creek.

The excavation of the new G.T.P. elevator at Fort William is well under way and plans for structure are in preparation. The Canadian Bridge Co., Walkerville, which has the steel contract, is ready to begin its part of the work when the spring opens.

The Fort Erie and Buffalo Bridge Company is applying at the coming session of Parliament for an act of incorporation and for authority to construct a general traffic bridge across the Niagara River from the village of Fort Erie to the foot of Ferry Street in the City of Buffalo.

Park Commissioner Wilson recommends the construction of a bridge at the Island to connect Centre Island and Hanlan's Paint, Toronto. The commissioner proposes building this of steel or concrete. The structure will have to be built at a great height in order to admit of the fire tug getting up the lagoon. The Park Commissioner also contemplates the construction of half a dozen other bridges across the various lagoons.

Navigation of the North Saskatchewan at Saskatoon, which is yearly increasing, already demands recognition. This is given in the swing span composing the middle of the bridge. Three spans on either end and a huge swing covering two spans and controlled by hydraulic power, will measure the bridge's length when complete. Its width will accommodate a single line of rails in the middle with a 12-foot driveway for foot passengers and vehicular traffic on either side. The work is being done and the material supplied by the Hamilton Bridge Company, who are rushing construction. The three south spans are nearly completed, and piling is driven for the temporary structure in the centre to carry materials and machinery across for building the three north spans. The swing will be the last constructed.

The agreement just entered into with the C. P.R. by Fort William for further exemption for taxation will involve a large expenditure in the city by the company, and will mean an immense amount of structural steel being used here in the next few months. Under this agreement the company will pay $30,000 per year into the city treasury for the next fifteen years and will build two steel swing bridges, one across the Kaministikwia river, and one across the McKellar river, at an estimated cost of $700,000, these two to be completed in eighteen months. In addition to this the railway company has acquired over 300 acres of land upon the islands at the mouth of the river, to which these bridges will give access and they purpose erecting an immense coal handling plant there which will employ a large number of men, both in construction and operation.

Planing Mill News.

The box factory at Rodney, Ont., is shortly to be enlarged.

Jas. Cameron has put up a shingle mill at Fallbrook, Ont.

Carnegie Milling Co. are building a sawmill at Port Perry, Ont.

McArthur's sawmill at Murillo, Ont., was recently damaged by fire.

Dr. D. R. Moore, of Stanley, N.B., has erected a new hardwood mill at that place.

Batt's, Ltd., have just completed a large addition to their planing mill at West Toronto.

The North American Bent Chair Company are making extensive additions to their buildings in Owen Sound.

The Felkirk Match Company, Ltd., Selkirk, Man., have obtained a charter. The concern is capitalized at $40,000.

The Moose River Lumber Co.'s sawmill at Parrsboro, N.S., has been burned at a heavy loss. It was not insured.

The lumber sheds, store and office of the William Cowan Company, Prince Albert, Sask., were destroyed by fire recently.

M. J. O'Brien, of Renfrew, Ont., has formed a stock company to take over the sawmill business of J. D. McRae at Eganville, Ont.

The Evans Company, Limited, have almost completed the erection of a planing mill and sash and door factory in Sudbury, Ont.

A Vancouver despatch states that the log market on Puget Sound is in an unprecedented condition, as every boom of logs has been sold.

A Shelburne, N.S., despatch says that it is expected that the Lewis Miller Company will build a large lumber mill at Jordan Falls this year.

The Wash Sash & Door Company, of New Westminster, B.C., recently reported running time and a quarter, or twelve and a half hours per day.

Mayor Evans, of Winnipeg, proposes that the city should open a lumber camp at the city's limits, at Lac du Bois, for the relief of the unemployed.

P. Kyle is rebuilding his sawmill at Merrickville, Ont., which was destroyed by fire last summer. It will be operated by J. Bigford and John Wilson as a custom sawmill.

Owing to the demand for their goods, the Wash Sash and Door Company, of New Westminster, B.C., are running time and a quarter, or twelve and a half hours per day.

The Royal Planing Mills on False Creek, Vancouver, have been burned with a loss of $100,000. About 250,000 feet of lumber were destroyed. Part of the sawmill and dry kilns were saved.

Recent Vancouver incorporations include: P. D. Hillis Logging Company, capital, $100,000; Glen Valley Logging Company, capital, $25,000; and Robinson & Lequime Lumber Company, capital, $15,000.

John McGrath, Peterboro, Ont., is erecting a sawmill at Lakefield. The machinery has been bought, and it is expected that the mill will be ready for operation, with a daily capacity of 15,000 feet, this month.

The Welland Vale Manufacturing Company's premises at St. Catharines, Ont., including a large stock of hoe, rake, spade and other handles, were destroyed by fire. Loss, $50,000, mostly covered by insurance.

Seaton Bros., boat builders, New Westminster, B.C., have purchased the Crane yards and will immediately carry out improvements. It is proposed to open a machine shop, wood working plant and, later on, a steel forging plant.

The Sanderson-Harold Screen Works, at Paris, Ont., have been destroyed by fire, with a damage of $50,000. The firm made chiefly screen doors, refrigerators, etc. Over a hundred men are employed. The factory will be rebuilt at once.

Delahey Bros., of Pembroke, Ont., proprietors of the National Manufacturing Company, which was recently burned out, have taken over the plant of the Cossitt Company, makers of agricultural implements, Brockville, and will made large extensions to the factory.

The Fernie Lumber Company's new mill to replace the one destroyed in the recent conflagration, is now in operation, and is cutting and shipping lumber. The entire plant is not yet completed. It will subsequently have a capacity of between 50,000 and 60,000 feet per day.

A. H. Vanwart, Fredericton, N.B., has purchased the sawmill of R. Kirkpatrick at Debec Junction. In the spring the machinery will be brought to Fredericton and will be placed in a new structure to be built by Mr. Vanwart. The mill is fitted with rotary, planer, lath and shingle machines.

A. F. Johnson, 703 North Main Street, Paris, Texas, proposes to establish a factory in western Canada for the production of shovel handles, and is enquiring where there is a supply of white or grey ash timber, which is growing scarce in the United States, and is the only timber that can be used in the manufacture of shovel handles.

The car building firm of Rhodes, Curry & Company, of Amherst, N.S., are buying large quantities of quartered oak lumber for interior finish from the Virginia mills and are shipping this lumber by sea to Halifax. This oak is being used entirely for the finish in the new cars which are being built by the company for the Grand Trunk Pacific Railroad of Canada. The company heretofore have bought all their oak in the New England States.

The old Scott Planing Mill, Galt, which recently was taken over by Hart & Carlaw, contractors and builders, is being equipped with modern new machinery, from the Cowan & Co. shops. At the present time one of the largest-size moulders manufactured by Cowan & Co. is being installed, and other machines from the same shops will shortly follow, the object of the firm being to fit the mill with the very best wood working devices known to the maker of building material.

The St. John River Log Driving Company, Fredericton, N.B., suffered serious loss from the recent floods. The company's sheer booms from

Crock's Point, 10,000 feet in length, were stored in the Nashwaaksis river as usual for many years, and the ice on this river breaking up, the booms were destroyed, a quantity of machinery, which had only been in operation a few days. Among the great timbers of which they were composed snapping like matches. Lewis H. Bliss, manager of the company, estimates that it will require at least $20,000 to replace the booms, which must be done before the ice breaks up next spring.

A Vancouver despatch says that Portland, Oregon, sawmills have been beaten out of a first instalment sale of 400,000 feet of lumber to the Government by Seattle dealers, who will deliver the material in that city from British Columbia and pay the $2 per thousand duty on it. The lumber is Douglas fir, intended for the Panama Canal, and is to be loaded on a transport at Seattle to be landed at the western terminus of the canal. Arthur Camwell, who got the contract, is an exporter of lumber from Vancouver Island. The average bid of Oregon firms was $10 a thousand, and as the foreign manufacturer has to pay the $2 duty on unloading the lumber in the canal zone, he will really sell the material at $8 a thousand or less.

Trade Notes.

The Sydney Foundry Company is instaling a modern steam heating system in the Jubilee Methodist church at Sydney.

Decatur, Bull & Co., Montreal, have arranged to handle the different lines made by the Erie Iron Works, St. Thomas.

The Canada Iron Corporation, Fort William, was awarded a contract for 12,300 feet of 18-inch water main for that town.

The Northern Engineering Works, Detroit, have furnished one of their No. 42 Newten cupolas to Cadillac Machine Co., Cadillac, Mich.

C. H. Rust, Toronto's city engineer, states that contracts for two and a half miles of iron pipes have been awarded to the Canada Foundry Company.

The Ottawa Car Company has received an order from the Halifax Street Railway for two pay-as-you-enter cars, similar in style to those in use by the Ottawa Electric Railway.

The Detroit Foundry Supply Co. have placed their second cupola in Hamilton. They are now instaling a Crandall No. 2 cupola for small heats in the Gurney-Tilden foundry.

The main switchboard, distributing boards and cabinets for the new drill hall at Sherbrooke, Que., are being supplied by the Hill Electric Mfg. Co., 1560 St. Lawrence Street, Montreal.

William Abbott, 334 St. James St., Montreal, has been appointed sole agent for Canada for the Cyclone High Speed Chain hoist. The hoists are made in several sizes suitable for machine shops, mines, etc.

The Laurie Engine and Machine Company, Montreal, have acquired the sole rights to manufacture and sell in Canada, the pulp grinders and wet machines of the Dilks Machine Works, Fulton, N.Y.

The Western Engineering Company has been incorporated with a capital of $100,000. General engineering and contracting work will be carried on. The situation of the head office will probably be in Montreal.

The Canadian Crown Castings Company has been incorporated with a capital of $499,000. They will carry on the business of making cars and rolling stock and general manufacturing pertaining to the same. The plant will, in all probability be in the vicinity of Montreal.

The Hamilton Bridge Works Company has been incorporated with a capital stock of $1,000,000. The incorporators are, Hon. John S. Hendrie, C.V.O.; William Hendrie and Walter B. Champ, of Hamilton; George M. Hendrie, of Windsor, and A. D. Braithwaite, of Toronto.

McKinnon Dash & Metal Works Co., St. Catharines, have started the manufacture of coil chain. The chains are electrically welded automatically and cold formed automatically. McKinnon Dash & Metal Works Co. control the patents of the world for the manufacture of this style of chain.

The patent rights to make and sell the Wing turbine blower in Canada have been granted the Laurie Engine & Machine Company, Montreal. This blower is a combination of a disc fan and turbine engine and the exhaust enters the furnace with the air, heating it and economizing fuel in this way.

The Temiskaming and Northern Ontario Railway Commission on January 15 awarded the contract for the building of two new switching engines for the Government road in the Kingston Locomotive Works, providing this company signs the necessary contract. There were three tenders for the contract.

At the annual meeting of the Independent Pneumatic Tool Co., Chicago, held at Jersey City, it was shown that export trade and business in the United States were improving and that prospects for 1909 were excellent. This company manufactures Thor pneumatic tools, including hammers, drills, saws, motors, etc.

The annual meeting of the salesmen of the Canadian Westinghouse, Hamilton, was held recently, when the salesmen from the various district offices from Halifax to Vancouver attended. The condition of business, and suggestions of mutual benefit were discussed and plans made for the present year. The concensus of opinion of the salesmen with regard to the business outlook was of a most optimistic character.

The Smart-Turner Machine Co., 191 Barton St., Hamilton, have recently supplied pumps to A. R. Williams Machinery Co., Toronto; Canadian Axminster Carpet Co., Hamilton; Canadian Towing & Wrecking Co., Port Arthur; E. Long Mfg. Co., Orillia; Ayr Electric Light Co., and a side suction centrifugal pump direct connected to a motor, to the Coniagas Mines, Cobalt. They have also supplied the Canada Screw Co., Hamilton, with a tumbling barrel, and M. F. Beach, Iroquois, Ont., with an 8-ton hand-power traveling crane.

Building Operations.

F. J. Rank, whose flour mill was destroyed at Norwich, will rebuild.

It is stated that a New York syndicate will erect a $200,000 sanitarium at Watrous, Sask.

Vancouver will have new stations erected by the Great Northern and Northern Pacific Railways.

The Western Milling Co.'s elevator at Calgary, burned at a loss of $50,000, will be rebuilt.

The electric light plant and Walsh's roller mill, Ormstown, Que., were recently destroyed by fire.

Andrew McIlquham is erecting a glue factory at Kingston. The building will be completed in June.

The Barnett, McQueen Co. has the contract for building the 1,500,000-bushel elevator at Port Arthur.

The B.C. Government will shortly let tenders for the new Central Insane Asylum building at New Westminster.

The total value of building permits in Toronto for 1908 was $12,447,467, as compared with $14,225,800 during 1907.

The School of Mining, Kingston, will ask the Provincial Government to erect a building for mining and mineralogy.

The building permits in Stratford during the past year totalled $136,545, as compared with $641,485 of the year previous.

It is probable that the C.P.R. will let the contract for the 2,000,000-bushel elevator at Victoria Harbor in a month's time.

The Harold Sanderson refrigerator factory, burned at Paris on Christmas day, will be rebuilt on a larger scale at that place.

Alberta, Saskatchewan and Manitoba are said to have agreed to build and equip a number of publicly-owned grain elevators in the West.

The International Heating and Lighting Co., Cleveland, have been granted an extension of time in which to commence operations in Edmonton.

The number of building permits issued in Montreal during 1908 was 1,283, and the aggregate value $4,317,753, which was $3,343,903 behind the previous year.

It is understood that a new wing will shortly be built to the Ontario Legislative buildings. In it will be located the library, archives, patent surveys department, etc.

Victoria, B.C., issued building permits to the extent of $1,121,140 during 1908. In the last fifteen years new structures have been erected in Victoria to the value of nearly $9,000,000.

The Hamilton Technical School building is nearing completion. The laboratories will be fully equipped for illustrating the work to be taught. The school will be ready to begin complete courses in September.

The plans have been accepted of Warren H. Milner, Seattle, for the large building for the Vancouver Horse Show Association. The estimates call for a construction to cost $30,000, but it is said that the cost will be closer on to $50,000. The building will be erected without delay at the corner of Georgia and Gilford Streets.

General Manufacturing Notes.

The Collingwood Shipbuilding Co. intend to greatly enlarge its plant at that place.

The Toronto Railway Co. will build new car barns to accommodate a hundred cars.

The plant of the Western Ontario Portland Cement Co., Attwood, Ont., will be sold.

Shurley & Dietrich's saw factory, Galt, is filled with orders and a large staff is working ten hours a day.

Toronto and Philadelphia capitalists are reported as going to build a shipyard and drydock at Sandwich.

Work on the new Thunder Bay elevator at Port Arthur has commenced and a great many men are employed.

Robert Richardi, of Arnprior, is negotiating with Fredericton for the establishment of a clothes-pin factory in that city.

A. W. Moore and A. D. Cooper are instaling at Alberni, B.C., a brick-making plant, so as to be ready for the spring building operations.

The Hamilton Steel & Iron Co., Hamilton, are planning to instal Gayley's dry air blast system in connection with their blast furnaces.

The Trinidad Telephone Co. is a new concern which intends to manufacture telephones and electrical instruments and appliances at Halifax.

The Down Draft Furnace Co., Galt, are working full time, and salesmen report a good demand for this firm's ranges, stoves and furnaces.

Sheldon's bed factory, Galt, during the past year was never on short time, and the prospects at present are better than ever before in the history of the firm.

A company of U.S. men propose drilling for gas in the vicinity of Peterboro and wish to get a franchise from that city and from Lindsay for the supply of same.

The Murray Shoe Company is about to erect a new factory on Richmond Street, London. It will be three storeys high and 50x300 feet. The new premises will accommodate 150 hands.

Milton property owners carried a by-law to guarantee the bonds of the P. L. Robertson Manufacturing Co., screw manufacturers, $10,000 for ten years, and pay the interest thereon.

The first traction gas engine ever built in Canada has been turned out at the Goold, Shapley & Muir factory, Brantford. It was built as an experiment which has resulted successfully.

The Welland Vale Manufacturing Co.'s premises at St. Catharines, Ont., including a large stock of hoe, rake, spade and other handles, were destroyed by fire. Loss, $50,000, mostly covered by insurance.

Niagara Falls centre will have a new factory erected by Brooklyn capitalists to manufacture boxes and other products from corrugated paper. A site has been selected and 200 hands will be given employment.

The Canadian Flax Mills Company is a new concern which has located in Chatham, with factory on Thames Street. From 12 to 15 men will be employed during the winter, and a new building will be erected in the spring.

Among other industries which are likely to materialize at Fort William this year is a shipbuilding yard and graving dock, which will also be located upon one of the two islands in the delta of the Kaministikwia river.

Fire destroyed the Globe Casket Company's factory at London on Jan. 18. The building was practically destroyed. The plant was valued at $150,000. The building and contents are an entire loss. The company may rebuild at Toronto.

The selling staff of the Pease Foundry Co., Toronto, were the guests of the officers of the company at a dinner on December 31. The day was spent in a staff conference, during which a discussion took place on the new features to be added to the Pease line of heating goods, as well as on the plans for a further extension of the company's business.

The Colonial Portland Cement Co., Wiarton, has assigned, and a winding-up order has been granted. The company has a splendid plant and owns a marl bed about a mile from the works and has a private railway connecting them, while the clay was brought down by scow from Griffiths Island. It is expected that the company will resume business in the spring.

The by-law for a bonus of $10,000 to the Warmouth Piano Co., to re-establish their factory, and which was defeated election day, will be submitted to the people again on February 4. The council agreed to this, and the Board of Trade is putting forth every effort possible to have the by-law passed this time. It was defeated by 47 votes last time. Other cities are anxious for the works, and have made tempting offers.

English Practice in Power Distribution Around Mills

Recent Experiences and Views of English Engineers and Experts on the Construction of Mills as to Shafting, Pulleys, Etc.

By T. LINTON

Canadian readers may be interested in the recent views of English engineers and experts on the subject of gearing for works and mills, which are, so to say, focussed in the following article. The mill engine has always been a favorite subject for writers, but the mill and works gearing, including in the "gearing" all shafting, pulleys and fixings, as well as toothed wheels, has received comparatively little attention. The gearing has probably been overlooked as the engine is so very much more conspicuous and there is more of that personality about it, which all engineers like to think of as existing in their creations; the utility of the engine can also be more readily expressed in figures; something, too, must be allowed for the fact that the engine is the visible source of power; the gearing being comparatively passive, a mere agent of transmission. Whatever may be the cause, it remains true that the gearing deserves more attention than it has so far received.

Experience proves that in some English works the loss of power in the gearing is from fifty to one hundred per cent. more than in others; in some cases this great loss is due to unavoidable obstacles, to simple and direct power transmission, which are, however, absent in most other works. In the majority of cases the excessive loss is due either to a badly-designed scheme of gearing, to indifferent design of the details, or to the gearing not being in proper adjustment, or to all three. Old works are usually inferior in this respect to more modern ones. This is not so much due to carelessness or inferior workmanship on the part of the older millwrights as to the fact that the work is old and out of alignment, that brasses are in bad condition and the lubricating arrangements imperfect. Moreover, the use of toothed wheels for transmitting power very often led to awkward arrangements of shafting. In particular the upright shafts driving the main lines of shafting of the several floors through bevel gears were responsible for much loss of power.

A consideration of works gearing naturally falls under three heads. In the first place the general arrangement should be well thought out; secondly, the design of the details should be good; and thirdly, the workmanship, including the erection, should be first class. A great deal depends upon the general arrangement of the gearing. It is easy to spend money on needless complications and badly arranged transmissions, which do not produce any adequate return and which are indeed usually sources of loss of power and involve additional capital expenditure. These remarks apply more particularly to old mills in which rooms have not been arranged in relation to each other, with a view to economical power transmission. Probably the works have been extended from time to time and frequent rearrangements of machinery have necessitated corresponding rearrangements of the gearing. But with a natural desire to make use of existing arrangements so far as possible and prevented by the structural arrangements of the buildings from ever making a simple and efficient job of the gearing, the millwright has often achieved a final result anything but satisfactory. Even in quite modern English works this re-arrangement has often appreciably spoiled the scheme of gearing, although in a modern mill the arrangement of the gearing is generally so simple and also so universal in its adaptability that the effect of a re-arrangement of the machinery should not very seriously influence the gearing scheme.

The first condition aimed at by English engineers in a gearing scheme is directness. As far as possible intermediate shafting and gearing are avoided by them. Each constitutes a source of loss and although there are cases in which they are justifiable, such cases are generally exceptional. Intermediate shafts are like superfluous middlemen in business. Generally toothed wheels should be avoided and especially bevel wheels. It is true that when well made, with properly-shaped and fitted teeth, and with the wheels and shafts firmly carried and accurately aligned, toothed gearing gives high efficiencies, although scarcely so high as a rope drive, unless the shafts are very close together or are inclined at an angle to each other. In practice these ideal conditions are seldom attained, and after a few years' working the adjustments are apt to be disturbed by the wear of brasses or the drying in of timber, beams or packings, with the result that the efficiency falls off seriously. With a rope drive such lack of adjustment does not affect the drive. The ropes form a very efficient flexible coupling, provided, of course, that the usual conditions necessary in rope drives have been complied with. Besides being comparatively inefficient, toothed gears are noisy and are scarcely so trustworthy as a rope drive. Not that the gears give out before the ropes, but they are more troublesome when replacement becomes necessary and are more apt to give out without previous warning.

In modern English cotton mills the drive is almost invariably by ropes from a pulley on the engine shaft to pulleys on the main lines of shafting as a rule only one line per room is directly driven from the engine, the other lines, when there are any, being driven from the former. The loss of efficiency due to this method as compared with the direct drive on to each individual shaft probably does not exceed two or three per cent. of the engine full load, and it simplifies the rope race. Indeed, the direct drive to each shaft is seldom possible in its entirety owing to the interference between the ropes and the rope race beams and shafts. In weaving sheds it is the usual practice to drive from the engine pulley by ropes to a second-motion shaft which passes across the ends of the cross shafts in the shed, driving them through bevel gears. This construction has been evolved because the shed is usually all on one floor and the lines of the shafting are too numerous to permit of satisfactory rope driving. The present arrangement could be modified so as to drive every third cross shaft by wheels from the second motion shaft, and to drive the others from the geared shafts by means of ropes. The improvement would be doubtful except as to noise, which would be reduced. In the old days in England the engine usually drove a second-motion shaft by means of spur wheels, the fly-wheel of the engine being the main spur wheel. The drive from the second motion shaft to the cross shafts of a shed was similar to that now in use, but in the case of works of two or more floors, the separate floors were usually driven by means of an upright shaft. These upright shafts were

continually giving trouble, chiefly at the footstep bearing. Indeed, when the shaft and its wheels were very heavy as where a large works of several storeys had to be driven, the pressure on the footstep rendered the ordinary means of lubrication ineffective and the only satisfactory method, which was, however, seldom adopted, was to supply oil under sufficient pressure to float the shaft. To a certain extent the jarring of the shaft by the action of the bevel wheels assisted the lubrication, but even at its best the upright shaft was unsatisfactory. The partial extinction of the toothed gear drive has been helped by the increased shafting speeds which are now usual. Toothed gears require a very firm and rigid support, or they will set up severe vibrations, which cause undue wear and sometimes breakage. Rigidity is never so necessary as when toothed gears are employed.

The simplest scheme of gearing is obtained when electric motors are used for driving the main lines of shafting, although a modern mill where the lines all run parallel with the engine crank shaft and are driven directly by ropes off the engine fly wheel is very little more complicated. Where the electrical drive is most advantageous (apart altogether from questions of economy or production) is in an old mill or works with ill-arranged rooms. An electric cable can convey current round the most awkward corners without any more loss than would occur in a straight length. Inasmuch as it is seldom necessary to run individual departments of many works alone, it is not usual to make provision for disconnecting the various lines from the rest, except by taking off the ropes, which, although a tedious process is so seldom necessary as to justify its adoption. Since the introduction of gas engines for works, however, it has sometimes been found desirable to relieve the engine of a part of its starting load and this is done by driving on to the main lines of shafting through one or more friction clutches. The use of these clutches is, of course, common enough in factories where individual lines of shafting or departments have to be stopped and recoupled while the rest of the factory is working.

GRINDING AND GRINDING WHEELS

By J. C. Carruthers.

Forty years ago a grinding wheel was practically an unknown quantity, owing to the rough state of raw material as compared with the greatly advanced practices of turning out castings, malleables, steel, etc., an immense amount of labor was expended to finish the crude material, which is now done in the grinding department. The first wheel to attract public attention was that manufactured by what is commonly known as the silicate process. Emery wheels have also been made by what is known as the Japan or paint process. Owing to its being adapted only to certain uses, however, it is not as well known as the silicate process. It is being made to-day in an improved form and commands a very large sale, especially where a wheel is required for fine steel or tool work, and more especially for saw-gumming purposes, as fully 60 per cent. of the saws gummed in Canada use this class of wheel. It is waterproof and has extra strength to resist breakage. This feature allows wheels to be made very thin. It can be used to advantage grinding out work.

The elastic or shellac wheel is a copy of the former, but owing to it not being able to withstand heat, naturally caused when in operation, it wears very rapidly when used for any but very light work.

A modern wheel is that made by what is commonly known as the vitrified process. The high heat to which it is subjected during the process of manufacture is sufficient to burn the dross which might be used in another wheel baked at a lower temperature. Nothing remains in the wheel but cutting particles. The wheel has a very open appearance, making a fast cutting edge. It is also water and acid proof and will not deteriorate from age. It can be altered to any degree of texture. From the softest wheel which can be cut away with an ordinary knife, it can be advanced to a degree of hardness that it would be impossible to displace the grains of emery or corundum. It can be readily seen that this feature recommends this process of manufacture to him. Experience and knowledge of wheels adapted to the different classes of work is an essential asset to the manufacturer, thus enabling him to satisfy his customer by supplying him with wheels of the proper grain and grade for his particular purpose, whether it be required to grind a can opener or a car coupler.

In the process of manufacture the bond of the wheel is first selected to make the wheel of the proper grade. It is then mixed in proper proportions with the grain of emery of corundum. This mixture is thoroughly mixed and is then put in an automatic mixer where water is added. After this operation, which requires considerable time, the material is then "poured" into rings placed on "bats," the rings being of various sizes, according to the sizes of wheels required. This material, which can now be called wheels, is put in a dry room to dry by a slow heat until every particle of moisture has evaporated.

After the drying process the wheel is then taken to the shaving or turning machine where it is turned down to the exact size required and the arbor hole turned out in the centre. This course is proceeded with until enough wheels are prepared to fill a kiln. An emery wheel kiln is a very massive and substantial structure, lined with three courses of fire brick and arranged by flues and draft spaces to make an even heat in every part of the kiln. These kilns are made from 10 ft. to 18 ft. inside diameter. The wheels are built up inside in "stacks," being placed on tile and surrounded by sections placed on edge around the outside edge of the tile. The space not occupied by the wheel is then filled in with emery or quartz and the top covered with another tile. This course is proceeded with until a stack is completed and the kiln is filled. Heat is then applied by an ordinary fire in the fire boxes, which are built in at the bottom of the kiln. A slow fire is continued until evaporation ceases when the fires are forced until the heat reaches the vitrifying point, which is ascertained by taking out small test pieces through test holes in the side of the kiln. A vitrifying heat is in the neighborhood of 2200 degrees.

There are other things besides virtue that bring their own compensation. Industry, honest and unremitting, pays a handsome salary though not a cent of it be in the coin of the realm.

Halifax, N.S.,
Feb. 4th, 1909.

Canadian Machinery,
G. C. Keith, Esq.,
10 Front St. E., Toronto.

Gentlemen: I have read with interest the articles on Technical Education in the December and January issues of Canadian Machinery. I think you are to be highly commended for your enterprise in this direction. The articles are clearly written and contain practical suggestive information.

Enclosed find $1.00 for one year's subscription to Canadian Machinery. I wish you would send me the back numbers containing articles on Technical Education, and I shall be glad to forward the amount for same.

I shall be pleased to send you our report when it is issued in about two or three weeks.

Yours very truly,
DEPARTMENT OF TECHNICAL EDUCATION,
F. H. Sexton,
Director.

Apprentice School of Cincinnati Milling Machine Co.*

The Need of a Systematic Method of Training Apprentices in Medium Sized Shops — The Course at Cincinnati Milling Machine Company's Works.

The necessity of systematic training of mechanics is being keenly felt by many manufacturers. President Nash, of the New York Corn Exchange Bank, is quoted as saying the following :

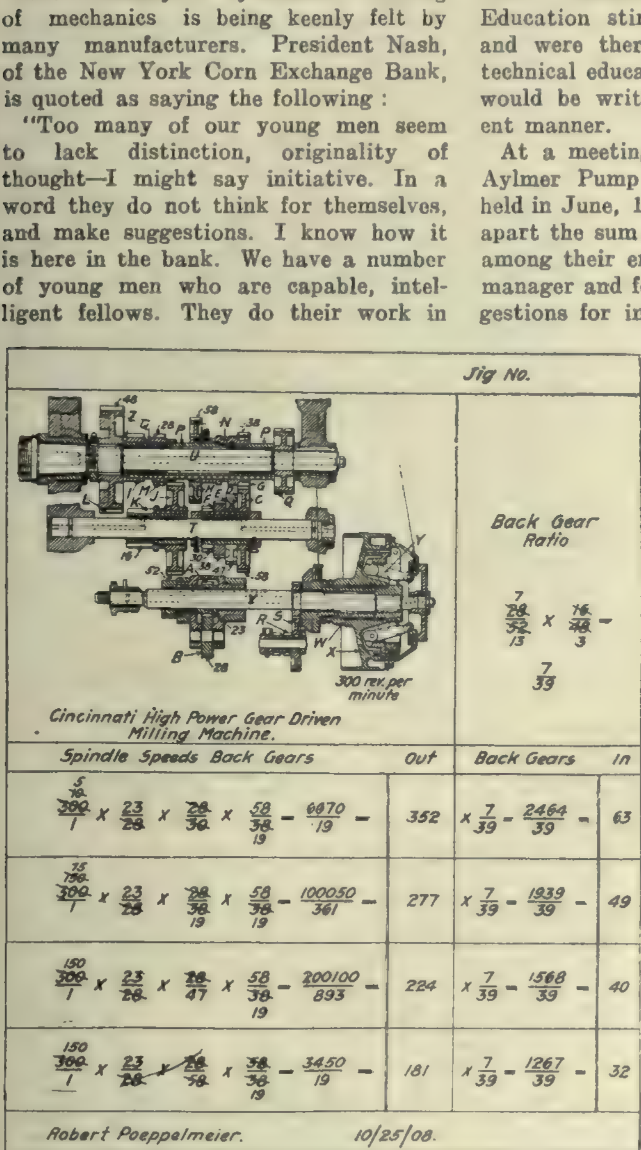
"Too many of our young men seem to lack distinction, originality of thought—I might say initiative. In a word they do not think for themselves, and make suggestions. I know how it is here in the bank. We have a number of young men who are capable, intelligent fellows. They do their work in a satisfactory way. Yet they do not come forward with new ideas. That is the thing a modern business man is always seeking in an employe. I know we are always glad to get them. We may not follow the suggestions, still the ideas are welcome."

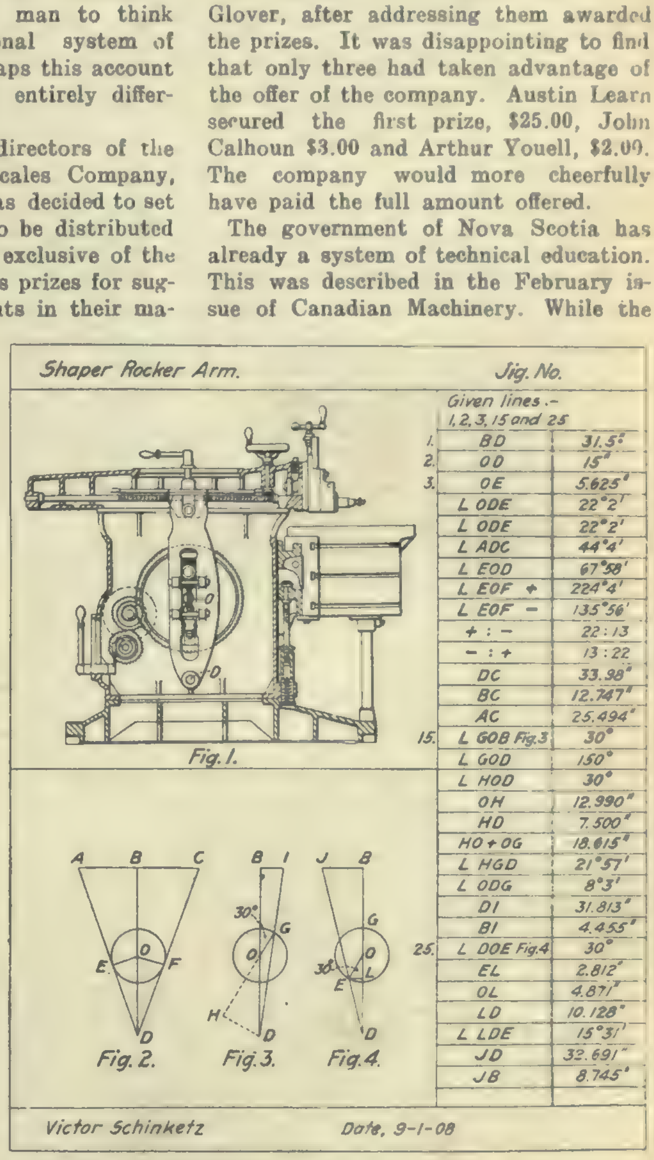
While this is not altogether true the following will show the necessity for more education for the mechanics. Education stimulates a man to think and were there a national system of technical education perhaps this account would be written in an entirely different manner.

At a meeting of the directors of the Aylmer Pump and Scales Company, held in June, 1908, it was decided to set apart the sum of $100 to be distributed among their employees, exclusive of the manager and foreman, as prizes for suggestions for improvements in their machinery and goods manufactured by them. Notices to this effect were posted about the factory, setting forth the division of such prizes, and the conditions under which they were to be awarded.

The object was to increase an interest among the men in their work, and of course the management expected to receive value in the new ideas suggested. Each competitor was given a number and those making the awards had no way of identifying the one making the suggestion. The men were called together recently and two of the directors, Messrs. W. S. Caron and J. H. Glover, after addressing them awarded the prizes. It was disappointing to find that only three had taken advantage of the offer of the company. Austin Learn secured the first prize, $25.00, John Calhoun $3.00 and Arthur Youell, $2.00. The company would more cheerfully have paid the full amount offered.

The government of Nova Scotia has already a system of technical education. This was described in the February issue of Canadian Machinery. While the other governments are slow to take the initiative, manufacturers can adopt systems of their own. The system used in the shops of the Cincinnati Milling Machine Co. is adaptable to any medium sized shop.





Jig Sheets Used in Apprenticeship School of Cincinnati Milling Machine Co.

Apprenticeship Schools at Cincinnati.

The apprenticeship school of the Cincinnati Milling Machine Co. was organized in May, 1907, and has thus been established long enough to make it possible to form an opinion about the results obtained. The apprentices work the larger part of the time in the shop under the supervision of the regular de-

*In March, 1908, appeared the G.T.R. Apprenticeship System ; November, 1908, Industrial Course at Fitchburg ; December, 1908 Urgent Necessity for Technical Education in Canada ; January, 1909, Co-operative Technical Education with Examples ; February, 1909, Recent Developments in Technical Education in Canada.

partment foremen, but receive instruction along more theoretical lines, having practical application, for two hours once a week. Forty apprentices are enrolled, divided into two classes of twenty. One class meets on Tuesday and the other on Thursday morning from ten to twelve. The boys are paid their regular wages during the school hours. A large room in the main office has been equipped with tables and chairs and is utilized as a school room.

The school has become a clearing house for shop troubles and the boy is free to ask any questions and propose any problems, no matter what its nature. Mr. Renshaw, the instructor, presents the questions so as to arouse interest, without which there will be no effort at study of any kind.

The manner of imparting the knowledge to the boys is interesting. To keep them employed continuously Mr. Renshaw designed a series of "jig sheets" which contain problems that the boy comes in contact with in the shop and that consequently interest him to be worked out by the boy himself. These jig sheets include problems in angles, in setting dividing heads, in determining the variable motion of a crankshaper ram; in fact, anything that is in the line of shop work, that is practical and will keep alive the boy's interest.

The Jig Sheets.

Two jig sheets are shown in the illustrations and are made up in such a form as to outline for the boy where to place the answer which he is required to obtain, and, in a general way, the manner in which it is to be arrived at. The name "jig sheet" has been adopted for the reason that the original instruction sheet contains simply the statement of the problem and spaces to be filled in by the student. The "jig," with its explanatory drawings, is drawn on heavy bristol board and is intended to serve as a guide from which the boy is to work—hence the name. The boy places a thin bond paper sheet over this jig and traces all the lines and the illustration on the jig, on this bond paper, the paper meanwhile being attached to the bristol board by means of paper clips. The size of the bristol board is 11 by 8½ inches, so as to permit using regular typewriter letter-size paper for the tracing. When the boy has traced the jig onto the letter paper, he carries out the required calculations, placing the results or the whole calculation in the spaces provided. The method employed not only gives the boy an opportunity of acquiring the habit of neatness in copying from an original and an ability to copy simple drawings, but it also provides a neat and permanent record of his work.

Another important feature of this method of instruction is that there is no necessity of a definite outline of a complete course which is likely to fail to arouse the interest of the boy. On the contrary, each boy can be given a problem to work on which has some connection with his regular shop work, and his interest is thereby stimulated. Individuality is given full play, and the boy is permitted to select for himself out of a list of jigs the one that interests him, after which the instructor sits down beside him and endeavors to explain the principles involved. Should the problem require more knowledge of fundamental mathematics than the boy as yet possesses, it gives a good opportunity to instruct the boy in pure mathematics without making it tiresome or wearying to him, the boy realizing that the mathematics he is being taught are absolutely necessary for the solution of the practical problem which he has selected for himself. Thus, for instance, it was found that a boy who took but little interest in exercises in the division of decimals, worked contentedly for one full month carrying out divisions to six decimal places, calculating the angle of tapers, when the length and the diameter were given and the tangent for the angle required.

The Cincinnati public library has added a circulating library for mechanics and about sixty volumes selected by the instructor are distributed among the apprentices.

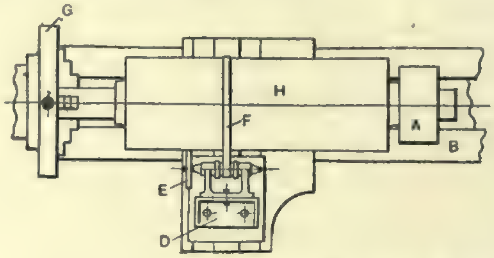
The co-operation of the public library has been valuable in that many books particularly adapted to apprentice education have been purchased by the public library since the inauguration of this apprenticeship school. This part of the scheme could be easily carried out in Ontario as the idea of circulating libraries for mechanics is already being carried into effect, as described in February Canadian Machinery.

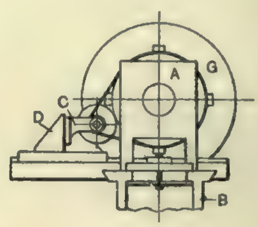
Mr. Fred Geier, President of the Cincinnati Milling Machine Co., takes a personal interest in the apprenticeship school, receiving reports and information concerning each individual at regular intervals, and this has had the effect of making the boy feel that if he is successful and makes progress, his employer will know about it and take a direct interest in him. This feature is very valuable and of great importance in creating ambition and a desire for progress. The co-operative system of technical education develops a better understanding among all concerned and the advantages received from such a system will reward the manufacturers.

GRINDING CHILLED ROLLS.

By Alfred Strong.

A pair of chilled rolls 3 ft. 9 in. long by 15 in. diameter came in to be ground recently. We had no tackle for such a job, but got over it in the way shown in plan Fig. 1 and end view Fig. 2. The roller was mounted in the lathe, chucked one end, and the other end run in its own housing A, mounted on the lathe bed B. It was run at a good speed. We took the grinding head C from a small grinder in the tool shop, and mounted it by means of an angle plate D to the slide rest, the emery wheel E being driven by the belt F off the roller itself. The slide rest was driven by the self-act in the ordinary way. G is the lathe chuck, H the roller.





Grinding Chilled Rollers.

This makeshift may be known to some of your readers, but we have never seen it before, and as it helped us a lot, we thought it might help others.—Mechanical World.

ACTION OF SAND BLAST.

In a discussion presented before the A.S.M.E. semi-annual meeting it was stated that strips of seven materials, mounted on a board and subjected to the uniform action of a sand blast for 45 minutes, show the following relative abrasive-resisting qualities, rubber belting being taken as the standard: Rubber belt, 1; rolled-steel bar, 0.66; cast iron, 0.28; balata belt, including gum cover, 0.2; woven cotton belt, high grade, 0.16; stitched duck, high grade, 0.13; woven cotton belt, low grade, 0.06 to 0.11.

He who trusts to luck is mighty lucky if he doesn't make a miserable failure of life.

Lathe Attachment for Turning and Boring Odd Shapes

Derrer Lathe Attachment for Turning Multi-Lobe Shapes with Some of Their Applications, Including Oval Shapes for Taper Drill Sockets and Shanks.

A lathe attachment used for turning and boring odd shapes is being placed on the Canadian market and is the invention of a Canadian, Harry Derrer, superintendent of the Algoma Iron Works, Sault Ste. Marie.

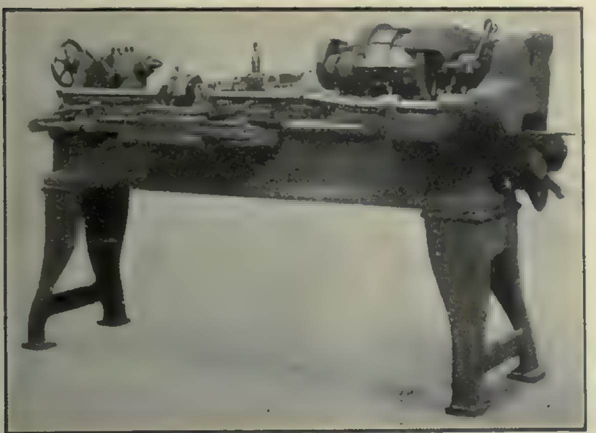


Fig. 1.—Lodge & Shipley Lathe Fitted with the Derrer Attachment for Turning and Boring Ovals and Multi-Lobe Shapes.

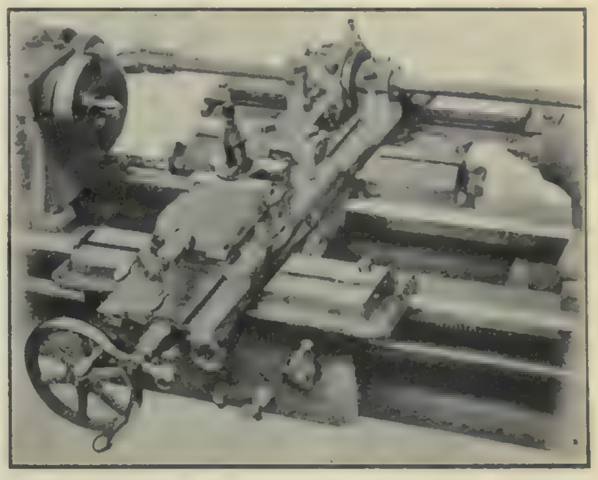


Fig. 2.—View of Lathe Fitted with Oval and Multi-lobe Turning and Boring Attachment, Showing Connection of Cross-slide with Eccentric.

A lathe built by the Lodge & Shipley Machine Tool Company, and equipped with a Derrer attachment for turning ovals and other odd shapes, is shown in Figs. 1 and 2. The device consists of a shaft carried in bearings at the rear of the bed, connected on one side by change gearing to the spindle, and on the other by a telescopic shaft to an eccentric on the cross-slide, the eccentric being arranged to reciprocate the tool-post in unison with the rotating of the spindle, thus producing the form desired.

A shaft may be turned square, oval, eccentric, etc., by changing the gears between the lathe spindle and the attachment. Thus gears are arranged in the ratio of 1 to 1 for eccentrics, 2 to 1 for ovals, 3 to 1 for 3-lobed cams and 4 to 1 for square sections. Increased ratios may be used for polygons of greater numbers of sides. The eccentric is double, the inner and outer members being rotable on each other so as to vary the throw at will from zero to ½ inch. A graduated disk is provided showing the throw obtained. For special work special eccentrics may be provided for any desired travel of the slide. Solid eccentrics (not adjustable) are substituted for the arrangement described above for producing work in quantities such as oval taper drill sockets here described.

The tool-post is mounted on a supplementary slide, dove-tailed to the carriage, and under the control of the taper attachment. This supplementary slide has cast to it brackets for the bearings of the sleeve on which the eccentric is mounted. The eccentric rod reciprocates the tool-slide, on which the tool-post may be adjusted to the diameter of work required. The main cross-slide screw operates the supplementary slide.

The lathe may be run as an ordinary engine lathe, and the taper attachment may be used for round tapers by disconnecting the driving shaft of the attachment on the back side of the lathe from the spindle. For plain, straight turning the block is disconnected.

The builders of the Derrer patent claim that the device is applicable to the making of drives of all kinds. By using the squared design with the ends of the shafts tapered, a square positive coupling drive is procured. The hubs of gears may be bored to a square outline to fit correspondingly square turned shafts. Milling cutters, shell reamers and other tools may also be fastened to their arbors in a similar way.

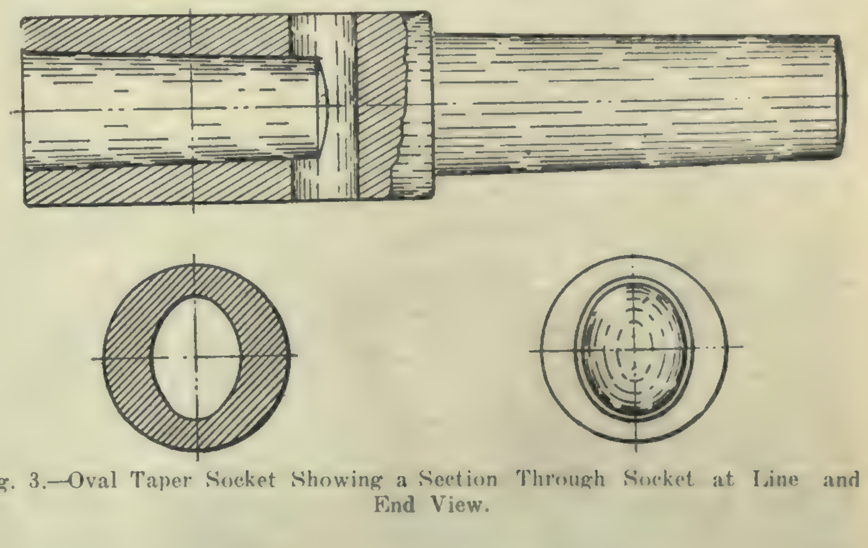


Fig. 3.—Oval Taper Socket Showing a Section Through Socket at Line and End View.

One of the products being placed on the market as a result of the lathe attachment invention is a line of oval taper drill sockets. The idea is to overcome the breaking of the tong on twist drills under heavy service.

The taper shank of the twist drill is oval in section throughout its length, and fits accurately a corresponding taper oval hole in the socket. When so made, there is no way for the drill to slip, the only possible accident being the breaking of the drill itself, due to an over strain. Fig. 3 shows a sectional view of the oval taper drill socket.

A standard on all the tapers of three-eighths of an inch to one foot and also a uniform standard of oval. In turning these a solid eccentric (non-adjustable) is used.

The lathe attachments and drill sockets are being placed on the Canadian market by the Elevator Specialty Co., Toronto.

Repairing Wrecked All-Steel Railway Freight Cars

A Process Which Reduces the Cost of Repairing Wrecked and Twisted All-Steel Cars Which Will Greatly Reduce Cost of Maintenance.

Fifteen years ago the first all-steel railway freight car was brought out in the United States, but not until about three years ago were they built in Canada. However, although Canada was perhaps a little slow in beginning their manufacture she is right to the forefront in the repairing of twisted, wrecked cars. The great advantage of steel cars is, of course, their lasting qualities, providing they do not figure in collisions or other wrecks. When these unfortunate events occur the cars generally present a most dilapidated and tangled appearance of bent and twisted steel, which to the casual observer is fit for nothing but the scrap heap. The straightening of these twisted cars has been an expensive and tedious bit of work, but developments have occurred which simplifies the operation.

Fig. 1.—Steel Freight Car Before Repairing.

Fig. 1 shows a car which seems only fit for scrap. A new car to fill the place of this one would cost about fourteen hundred dollars. Fig. 2 shows it repaired at an actual cost of only one hundred and sixty dollars. This price includes all labor, fuel and any new parts. The new parts consisted of splice pieces for the sills, angles, plates and rivets. The angles are small short pieces and the plates merely patches to holes in the original plates.

In this particular case the apparatus used in repairing included a small, portable oil heater, a portable oil rivet forge, two small 9-in. jacks, two 24-in. lever jacks, two chain blocks, air hammers, dolly bars and sledges. All of these take up very small space in a wrecking car and are used right on the

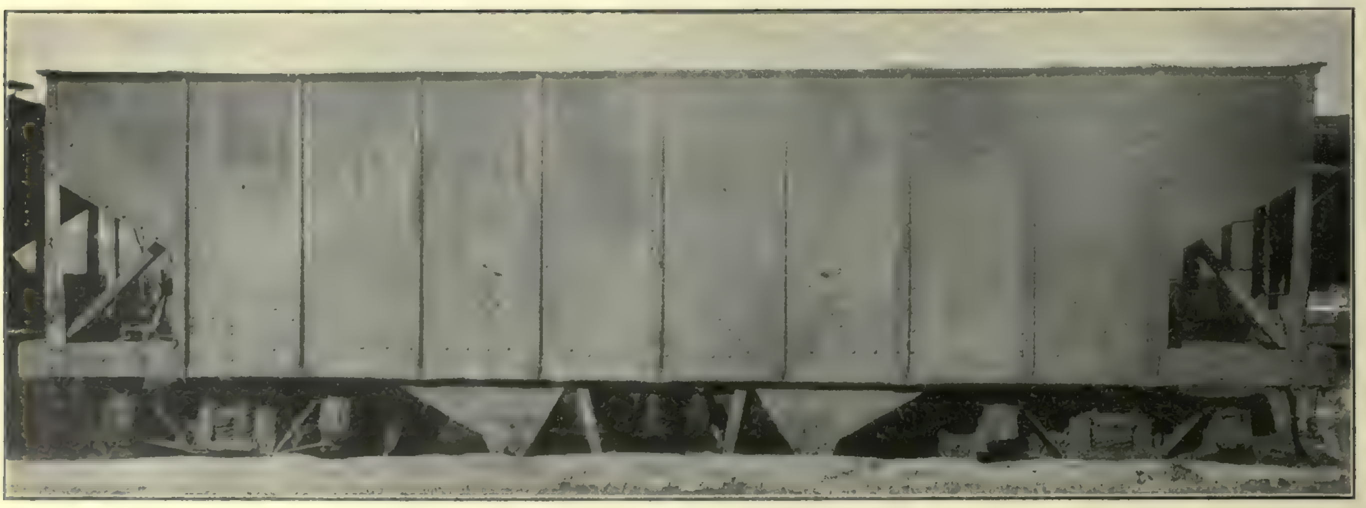


Fig. 2.—The Steel Freight Car Repaired.

spot of the wreck wherever an engine can go to supply air.

Fig. 3 shows a F. Hyde & Co., "King" oil heater in operation, heating a sill to be straightened. In the photo O is the chamber containing the crude oil fuel, G is the chamber in which the oil-gas is generated and from which it is piped to the burner, which is manipulated at the will of the operator, who plays it over the part to be straightened. A is the air pipe.

In this photo the method followed can be clearly seen. A screw-jack is placed under the piece, which in this case is a centre sill and was bent 6 in. with a double offset. The sill is chained at each end to the rails and is straightened by means of the jack.

A Canadian railroad has recently been making experiments with this method of repairing, and have repaired 25 steel cars at an average cost of only thirteen dollars and fifty-five cents per car, including all material and labor. The repairs consisted of bent doors, end sills, centre sills, sides, etc. The cost of the badly wrecked car in Fig. 1 is included in this average.

Fig. 3—Repariring Sill of Wrecked Steel Car.

IMPROVEMENTS IN METAL CUTTING.

By Samuel K. Patterson.

The day when in large shops the questions of tool shape, cutting speed, and feed are left to the individual operator, or to the shop foreman, who decides them from his own personal experience, or by the rule of thumb method, with results that have been heretofore acceptable, is fast drawing to its close. The shop owner who is alive to the possibilities of improvement is embracing the opportunities for increased output, which is offered today through a scientific knowledge of conditions, obtained as a result of experiments in recent years. It is a regrettable fact, however, that the average shop-owner has not as yet fully accepted these conditions, and is still satisfied to continue under old methods and ideas.

While it is true that vastly important and gratifying experiments have been carried on for a number of years, notably those of Mr. Fred W. Taylor and his associates, and that various methods and formulas have been evolved therefrom that are of the utmost value. It is also true that the varying individual conditions extant in the numerous small shops call for individual experiment and recording. The author adds his plea for the development and compilation of experiments by the average small shop and a more extensive and general knowledge of the use of the scientific formulas and gauges which have been developed as a result of past experiment. Real progress beyond what has already been done, in this field, is largely dependent upon the accumulation of endless records of operating conditions through the co-operation of a large number of operators having a thorough knowledge of scientific progress up to the present time. Not only does this scientific influence cover the actual cutting operation of the machines, but it is extending more or less into the entire shop and may be felt in all operating conditions.

Simplicity is gradually becoming the key note in the modern shop, and tool types are being used with standardized shapes for all edges of cutting tools. The unusual shapes and unscientific designs of a few years ago are disappearing, with the realization that scientific knowledge is becoming more and more an essential detail necessary to the successful progress in this field of labor. Specialization of duties is also obtaining recognition, and in the best developments along these lines, a single man, or sometimes several, takes entire charge of the tools, their preparation and maintenance, while the duty of another man, or set of men, is the maintenance of pulleys, shafting and belting. Money so expended, has proven to have been well spent, in increased efficiency and decreased cost of renewals, etc. Such specialization is not nearly so general in the small shop, nor even the average large shops, as it should be, and yet the increase is fairly steady. There are records where in small shops, and with pronounced success, scientific development has been carried to an extent that might be considered extreme even for large shops.

Metal cutting has as yet a long way to go before reaching its final stages, owing partly to the large amount of uncollected material which must be gathered and classified, and further, to the large number of variables which govern the determination of the best operating conditions, and the varying effect of these on the data necessary for most efficient operation. The machine itself, in construction, and purpose, and its operation, the tool and its ability to stand up, and other properties, and lastly, the material to be cut, are the three prime factors involved in metal cutting. Several variables are possessed by each of these primal units, which in turn react upon the variables of the other units, producing at least a dozen variable factors to be considered in a determination of cutting speed, rate of feed, depth of cut, etc.

Primarily the results are dependent upon the character of machine, whether lathe, planer or milling, and secondarily upon design and character of work required,—whether it shall be used only for roughing, or for ordinary, or for very fine finish. Similar conditions, differing only in numerical values, hold for most of these machines, but the ones most generally known are those for lathe operation, and are probably more universal in application, while not of more importance, and are therefore more far-reaching in results. Fundamentally the same problems, though in radically different forms, are met with wherever metal cutting is encountered. A study of conditions generally existing, has given results which, while far from complete and only partially investigated, have been such that in roughing work, total increases of over 100 per cent. are very common, for a given machine, in many plants. So many factors are to be considered in the determination of depth of cut, cutting speed and rate of feed that under these conditions experience counts for almost nothing, and the oldest and most experienced hand will be nonplussed to see vast improvements made in the same work by a green man, apparently just out of his apprenticeship.

For those who are interested and contemplate some such developments as pertaining to metal cutting, a brief review of the various factors, and their

relation to the work, will probably be of more than passing interest. As an illustration, take a case of ordinary roughing on a lathe, and the operator's first queries will be, what tool shall I use? What cutting speed and what feed? Personal experience, or often the experience of the foreman was formerly depended upon to answer these, and valuable time and power consumed before a satisfactory result was obtained. Often indeed the operation was so prolonged and delayed by frequent changes and shifts that the result was expensive and by no means perfect, while the entire operation was inefficient and erroneous, as a scientific study of the involved factors has proved. In the answers to the above usual questions, and relating to and dependent upon them and each other, are numerous factors, some of which, not necessarily in the order of their importance, briefly would be:—Quality of metal to be cut, diameter of work, depth of cut, elasticity of material and tool, shape of cutting edge, its clearance and angles, chemical composition of steel from which tool is made, treatment of tool as regards heat and temper, the use of water to cool tool and work, amount of work required, duration of cut, pressure of shaving on the tool, changes of feed and speed possible, construction of lathe, effect of driving and feeding power on such construction.

These, therefore, are a few of the factors, whose influences are so complicated and related to each other that the rule of thumb man who attempts to adjust them from his own experience or knowledge, is often apt to go far wrong and in fact to operate at a small percentage of the efficiency possible under more intelligent and accurate manipulation. While there are in use to-day a number of slide rules and gauges to determine depth of cut, etc., their use is more or less arbitrary, and lacking in a knowledge of the principles and theories of their construction and the result has often been a decreased production. If a gauge is to be of any value at all, it should be constructed along mechanical lines, and by experiment be specialized to a particular machine, as so many varying conditions exist, and best results are thus obtained.

As an outcome of experiment with these varying factors theories have been established and facts proved that have in a measure completely upset the old and brought forward a new practice.

To illustrate, it is known to-day that a round-nosed tool can be run under given conditions at a much greater cutting speed and heavier feed than was at one time supposed possible, the old axiom of slow speed and coarse feed being superseded by high speed and coarse feed, and consequently a round-nosed tool will turn out much more work than the old diamond pointed ones.

Again, development in tool steel has reached such a point that on account of this improvement alone the cutting capacity of a given machine has increased as much as 100 per cent., while with a general knowledge of the factors much further progress and efficiency may be expected. This may not be confined only to the better actual preparation and use of tools, but the discovery and adoption of still more efficient ones.

There has also been a considerable change in practice in regard to the cooling of tool and work; whereas a fine stream of water or practically none at all was formerly utilized, it has been found that heavy streams, poured directly upon the chip at the point of removal from the steel forging by the tool, results in an increased cutting speed of from 30 to 40 per cent. Primarily this water is a cooling device, but, as it is generally mixed with soda and has some oil in it, which forms a fine emulsion, it undoubtedly aids the cutting process.

Briefly, therefore, these are some of the results of careful experiment and investigation, and together with many others, form a scientific basis on which the progressive shop-owner or foreman can work, and which, with a proper understanding of principles and factors, will bring higher efficiency and greater output.

NEW METHOD OF CUTTING OUT METAL SHEETS.

The punch illustrated below is specially constructed to cut out metal sheets into any desired shape, templates, sweeping boards for foundries, and all kinds of curved shapes required in everyday shop practice.

It is not a machine for repetition work, such work being more suitably done by means of special dies and punches, but it is essentially a machine for use when only one or two pieces of a similar shape have been required.

No. 1 machine has a gap of 12-in. and is suitable for plates up to ¼-in. thick. No. 2 machine, shown in Fig. 1, has a gap of 24 ins. and is suitable for plates up to ¼-in. thick.

The machine runs at high speed, 300 revolutions for the No. 1 machine, and 250 revolutions for the No. 2, and is furnished with a punch of a special shape, as shown in Fig. 2. The cutting edge of the tool is in front and the back of the punch is prolonged to act as a stay. The cutting edge can be set in any direction to suit the work.

The stroke of the machine is slightly greater than the thickness of the piece to be cut and the movement is obtained by a special eccentric motion.

The end or tail of the punch of the machine works in a die which is placed

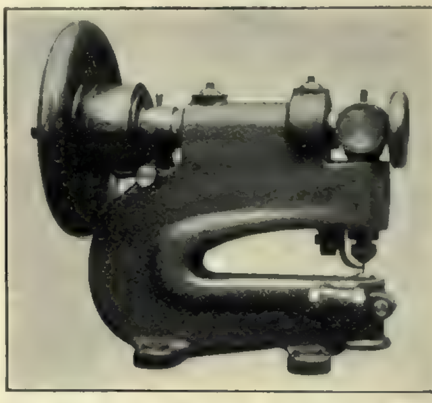


Fig. 1.—New Method of Cutting Out Metal Sheets.

in the anvil of the machine just below the punch and the tail of the latter is long enough to work up and down in this die throughout the stroke, so that it affords a very efficient stay for the punch.

The die above mentioned can be raised or lowered by means of a screw to enable the operator to pass a sheet of metal under the punch, so he may begin to cut in a hole in the middle of the plate.

The groove left by the punch acts as a guide and the operator has simply to

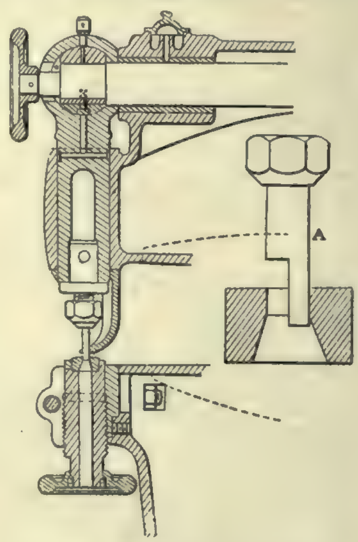


Fig. 2—Details of Punch.

place the plate under the punch and turn it slightly to obtain any desired shape.

The above machine is made by the Societe Anonyme des Etablissements Ph. Bonvillain & E. Ronceray, 9 and 11 Rue des Envierges, 17 and 19 Villa Faucheur, Paris.

Accurate Cost Keeping as an Aid in Manufacturing

Third Article of a Series on Cost Keeping in Which the Paying and Premium Systems in Use by the Canadian Locomotive Company, Kingston, are Described.

Every two weeks the timekeeper makes out the payroll shown in Fig. 1. Under "No." is entered the check numbers in order, as 101, 102, 103, etc., and these are written on both sides of the sheet for facilitating the work of the clerks. The day-work hours go in the columns under "hours." These are entered for each day and totalled, this total number being entered under "total hrs." Under premium is entered the amount awarded the workman for efficiency. The method of arriving at the amounts due each workman is described in this article. The total amount is then entered under that heading. A blank space is left in the centre for binding purposes, the sheets being filed away afterwards for reference.

THE CANADIAN LOCOMOTIVE COMPANY, (Limited.)

Form 10.

Time Book ______________ Two Weeks Ending ______________ 190

No.	NAME	OCCUPATION	M	T	W	T	F	S		M	T	W	T	F	S	Total Hrs.	Rate	Premium	Total Amount	Stoppages	No.

Fig. 1.—The Fortnightly Payroll.

A receipt is required from each mechanic and this is made out from the payroll. They are distributed among the men before the hour of payment. If there is any error the workman must notify the foreman immediately. The receipt must be presented at the wicket as the men file out.

The men line up in order of number and the clerks who have previously counted the money into envelopes, give out the money in return for the receipts. This system has been found to work very satisfactorily.

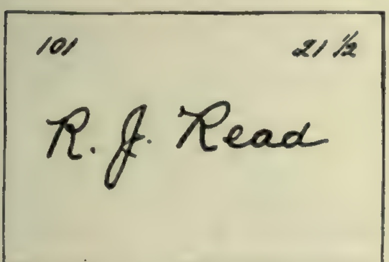


Fig. 2.—Rate Card.

Rates of Employes.

The rates are arranged so that no time will be lost copying them into the shop statement and labor slips. Plain white cards 2 in. x 3 in., shown in Fig. 2, are arranged according to numbers in a small box.

It is then easy for a clerk to go through the box and write out the rates on his pay roll and other lists. When the time-keeper gets an order from a foreman for an increase, the rate may easily be changed without destroying the card.

Employe's Record.

In the office is a record of all employes, both past and present. Two files are kept and new men are entered up immediately on a card, as shown in Fig. 3. A clip is used on the letter denoting his name, and the cards are filed alphabetically. All the spaces are filled in and changes of rates of wages, etc., are filled in from time to time, keeping the record complete.

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

NAME ADDRESS CHECK No.

REFERENCE

AGE MARRIED HABITS CHARACTER

DATE EMPLOYED DATE LEAVING REASONS

WAGES PER HOUR DEPARTMENT

SPECIAL AGREEMENT

WAGES INCREASED TO PER HR TO PER HR TO PER HR TO PER HR TO PER HR

DECREASED TO PER HR TO PER HR TO PER HR TO PER HR TO PER HR

REMARKS

Fig. 3.—Employe's Record Card.

If an employe leaves, the reason is written on his card, which is then transferred to that of past employes. These also are filed alphabetically, so that if a man again seeks employment the company knows exactly at what work they can place him advantageously. A card 4 x 6 in. is used for the employe's record.

Premium System.

The time limit on work from which the amount of premium is found is given under the direction of the chief cost clerk, who has had several years' experience in the work. If the pieces on which machining is to be done are different from any previously made, reference is made to the drawings. These are compared with those on which a time limit has been set, and the time given accordingly. Time is allowed for setting up the work, changing and machining. The workman who saves an hour is paid for that hour at a flat rate that the company has decided upon. The mechanics as a rule make quite an addition to their regular wages by taking advantage of the premium system.

When a workman begins a new job the time limit is written in a book provided. When a job is finished the card shown in Fig. 4 is filled out. If the contract is a large one, the mechanic is allowed to divide it. For instance, if a man is fitting twenty con-

necting rods he is allowed to put in a premium card when five are completed.

A reference to Fig. 4 will show the working of the premium cost card. The card contains the man's name and number. If there are twenty crosshead shoes to be fitted, "20 crosshead shoes" is inserted in the space at the top of the card. The card is filled in as shown at Fig. 4. The amount of premium is entered opposite his name in the pay roll. If there are a number of jobs on which a premium is to be paid, the workman sends in a fortnightly statement of the jobs. The total amount is added up and entered opposite his name in the pay roll.

Form 5

ORDER NO. 615 **PREMIUM COST CARD.** MACHINE NO.

Robt. Falconer

COM		DRAWING NO.
PIN	20 Crosshead Shoes	SKETCH OR PATT. NO.

AT THE RATE OF	HOURS	RATE	AMOUNT
1/2 hour each	10		
#371	5	20	1.00
Prem.	5		
PAID			
CHECKED BY			

FOREMAN ☐ APPROVED ☐

Fig. 4.—Premium Card.

A card similar to Fig. 5 is kept in the cost department, giving details of time limits on different jobs. If another order is placed for the same type of engine it is then very easy to refer to this card and enter the time limit in the workman's book.

NAME—Engine Base OPERATION—Shaping

CONTRACT	PATTERN	TIME LIMIT	PRICE	ACTUAL TIME	REMARKS
612	A 9	1½ hrs ea.			Two cuts
613	A 16	2½ " "			Two cuts
614	A 12	1½ " "			Two cuts 18"x30"

Fig. 5.—Card for Filing Rates.

In the April issue will be given the system followed in the cost department to obtain the summary cost of labor and material.

The familiar illustration of the dripping water proves that perseverance will overcome almost anything. When a man gives up, it simply indicates that the resistance was stronger than his own perseverance.

Recent Developments in the Manufacture of Steel

Dr. Eugene Haanel, Director of Mines, Gives Preliminary Report of Experiments in Sweden — New Tool Steels at Sheffield, Eng., and Toronto.

Dr. Eugene Haanel, Director of Mines, has returned from a visit to Dumnarfvet, Sweden, where he inspected a new electric smelting process. As a result he is confident that the new method is a commercial success. Ontario has no coal and with large water powers and enormous supplies of iron, the commercial success will mean much to Canada.

In his preliminary report on the experiment at Sault Ste. Marie in 1905 and 1906, Dr. Haanel stated that the furnace there tried needed certain modifications to render it a commercial possibility. This report awakened lively interest in Sweden, where the conditions are similar to those of central Canada. A company was organized, able young engineers were put in charge, work was carried on for a year and a half with eight new furnaces constructed according to the results of the Canadian experiments described in Dr. Haanel's report. As soon as the company had their plant properly established and in complete working order Dr. Haanel was invited to inspect them.

The new furnace is very similar to a blast furnace in which the tuyers are replaced by electrodes. A three-phased current is employed and about 700 horsepower delivered to the furnace, which is large enough to employ fifteen hundred horse power.

Dr. Haanel assured himself that the furnace met his expectations as a solution of the problem of construction an electric furnace on a commercial scale. The furnace worked well, the electrodes required no regulation, not having been moved for five days. The time occupied by the experiment was too short to ascertain what the output would be.

In addition to this work, the Dumnarfvet works have invented a steel furnace in which a three phased current and two electrodes are used, the bottom of the furnace furnishing the third electrode. The special advantage of this is that the three-phase current produces a rotation of the bath in a vertical plane, thus bringing new material continually into the slag line for purification.

New Steel at Sheffield.

Seeking a way out of litigation which threatened English manufacturers of air-hardened steel from the Bethlehem Steel Company of America, who claimed the patent rights, a new steel has been placed on the market by Jonas & Colver, Sheffield.

The steel can be hardened in oil or paraffin equally as well as in water. Experiments show that a tool made of the new steel worked on very hard material for a day and a half without re-grinding.

Steel Direct From Ore.

A new process of making tool steel from common and low grade ore and old metal is being experimented with at the machine shop of John Whitfield & Son, Toronto, and if successful a syndicate may be formed to take over the process and develop it on an extensive scale. A rusty wire nail transferred into a razor is one of the exhibits shown as a result of this process and chisels have also been made. The plan is to utilize the Lash process, a method owned by Buffalo parties. A plant will be located near a waterpower in Ontario, where electricity can be developed, which would give heat sufficient to change the ore into steel without sending it through the pig iron stage and Bessemer process. The ore is crushed and run through a refining process, mixed with carbon, sawdust and fluxes and then made direct into steel, thus doing away with the middle treatment.

The man who can't and the man who can but doesn't, jog along together.

MACHINE SHOP METHODS AND DEVICES

Unique Ways of Doing Things in the Machine Shop. Readers' Opinions Concerning Shop Practice. Data for Machinists. Contributions paid for.

HOW THESE RINGS WERE TURNED

By E. S. Cooper.

In a small country shop they built a machine that required four wrought iron rings about 3in. interval diameter, made of ⅝ in. square stock, and finished all over. These were threaded inside 8 threads per inch and had never been made more than 2 sets at a time so the question of improved tools had not been important.

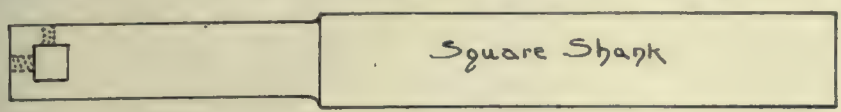
An unexpected order for 6 machines caused a sensation in the shop and stirred things up to some extent. These rings had always been made in a heavy lathe which had an English type of tool holder, splendid for heavy work, but rather cumbersome to handle on smaller jobs where it was necessary to change the tool frequently.

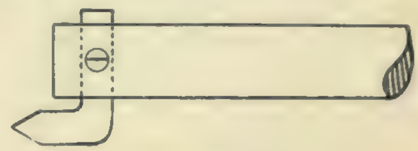
For this job the lathe hand took a 1½ in. square bar of iron about 10 in. long he found in the scrap heap, turned the corners off it for 4 in. back from one end, put a ⅝ in. square hole through it about ⅜ in. back from the end, and drilled and tapped it for 5-16 in. set screws in the end and top, making the tool look like Fig. 1. This was a good heavy tool holder that was handy for lots of jobs and should have been made long before it was. Square steel made the tools and the idea was that they should do all the chuck work so that the holder would not have to be changed during the entire job.

The first operation was to force off the ring and this was done with a tool as shown in Fig. 2. As you will note, the tool projects beyond the end of the bar for facing the rings.

Ordinary straight boring tools were used for turning to the proper internal diameter for threading and the back of the ring was faced off as close up to the chuck jaws as possible. This was easily done by grinding a clearance on the back of the ⅝ in. tools and any little burr left was ground off on the emery wheel. The reason for facing off the back while in the chuck was that it allowed 4 rings to the screwed onto a mandrel together and saved a lot of time on the outside finishing operation. The edges of the bore were well bevelled off so that when the chasing of the thread was done there were no burrs projecting over the sides. This made less threading and left the faces clean so they came together properly on the mandrel.

The use of these tools made a saving of 50 p.c. on the time of the job as done before, partly due to the quickness of changing the tools over the old method and partly to the stiffness of the tool holder over the light ordinary tools as used before.





How the Rings were Turned.

MILLING ATTACHMENT FOR LATHE.

By Ethan Viall.

In reading Arthur Baldwin's article under the above heading in the December number I was reminded of an attachment a friend of mine made for the cross slide of his lathe, which for some work is, I believe, handier than the one described by Mr. Baldwin.

If the attachment were used on a lathe with a tilting cross slide, like the Read, it would be better than on the style of lathe shown in Fig. 1, but one must use the lathe at hand, so my friend has to depend entirely on the capstan screws for height adjustment.

Fig. 2 shows this attachment in detail. A is a knurled nut used to lock the index arm spindle. B B are nuts used to lock the sliding centre heads. C is the tail centre, which is so made as to slide in or out, and is locked in position by set screw D. E is the nut which engages the cross slide screw.

With this attachment various sized gears or cutters may be made with very satisfactory results.

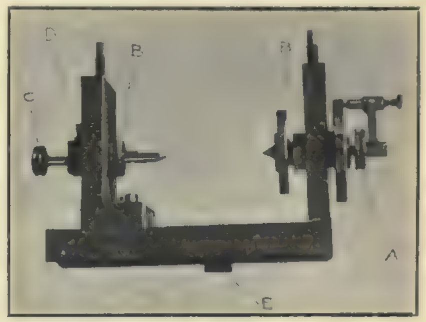


Fig. 2.—Attachment in Detail.

Fig. 1.—Milling Attachment for Lathe.

RAILROAD SHOP WORK.

The process of crude oil welding has been in successful use in the Bellefontaine shops, for some time. The first process followed in these shops was to use one burner, but it did not give very good results. Two burners were then used, which welded locomotive frames satisfactorily in every way.

Fig. 1 shows how frames are prepared by the machinist, and Fig. 2 shows the small brick furnace used in welding frames.

Forming Dies.

Mr. Mayer, of the Michigan Central Railroad, at Detroit, furnished descriptions of several forming dies to the International Railway Master Blacksmiths' Association. These are illustrated in Figs. 3 and 4.

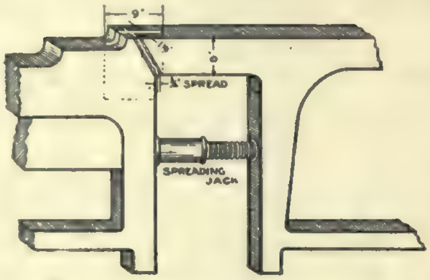
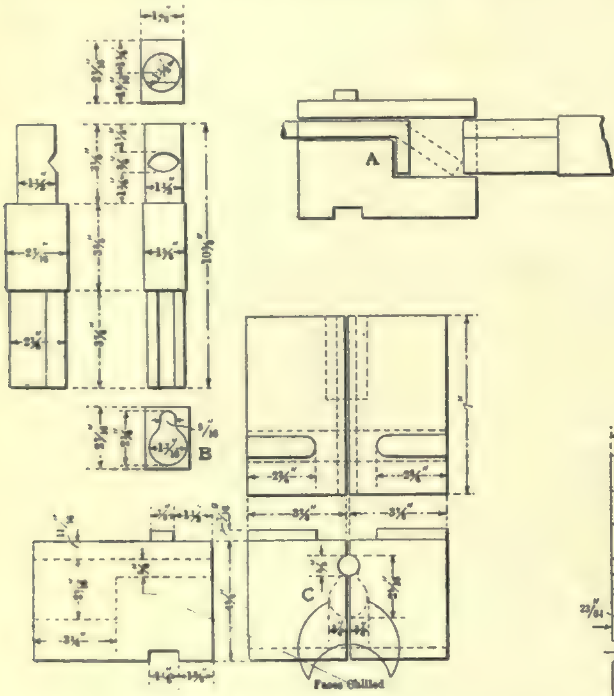


Fig. 1.—Crack Opened for Filler.

Fig. 1 shows in detail a die for the making of ⅝-inch round hand holds or grab irons on the 1½-inch Ajax upsetting and forging machine. The pear shape of the upset, under action of the punch, can be seen in the dies at A, B and C. These dies are made of cast iron and are put in service just as they come from the foundry, without machining, and are good for from 10,000 to 12,000 grab irons.

Fig. 2 is a bolt-heading die which can be applied to any style of bolt or forging machine from 5-inch to ½-inch. When this die was first installed, steel was used in its construction and 5 to 6,000 bolts could be made on one pair. After changing the style of this die, making the side blocks adjustable and using cast iron, 81,000 ⅞-inch bolts were made with one pair and 100,000 ¾-inch bolts with another, all of these dies being good



All Parts Cast Iron

Fig. 3.—Upsetting Dies.

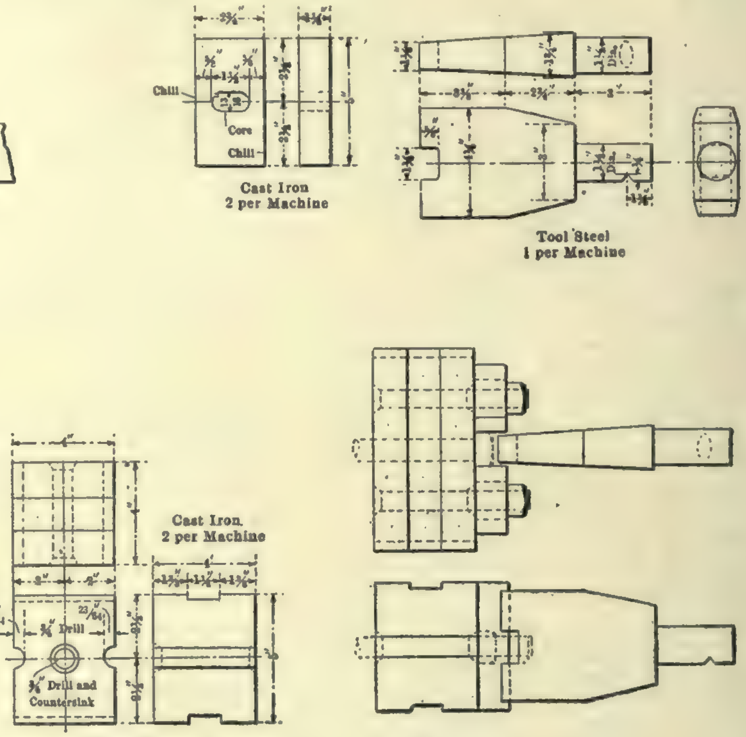


Fig. 4.—Bolt Heading Dies.

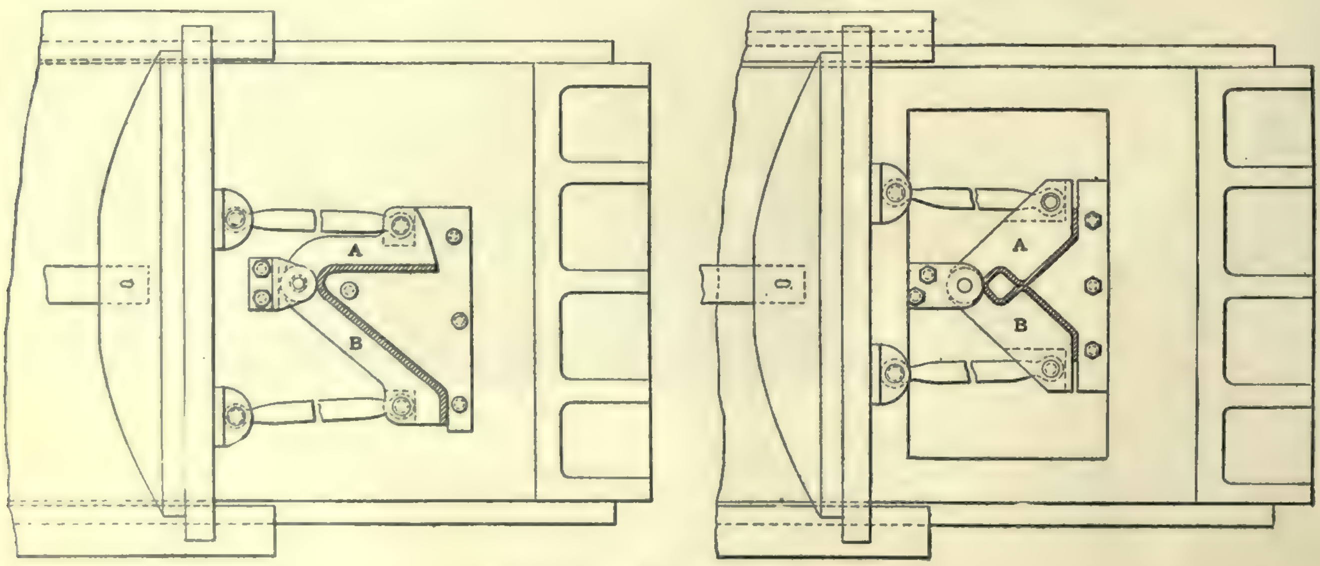


Fig. 5.—Two Bending Dies.

for more, as none of them had been in the machine shop for repairs.

Fig. 3 shows in detail a former for bending running-board brackets for box and refrigerator cars, used in the Pennsylvania Railroad car smith shop at Al-

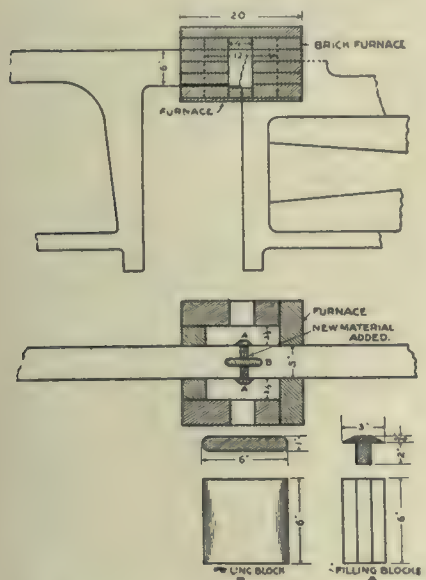


Fig. 2.—Plan of Furnace and Filling Pieces.

toona, Pa. These brackets are made from ½-inch x 1½-inch material, cut 22½-inch long. With wings A and B of former standing open, a piece of material is placed in position and each motion of the machine forms a complete bracket.

Fig. 4, shows in detail a former, for bending brake-shaft brackets for box cars. These brackets are made from ⅜-inch x 1½-inch. material, cut 14¼-inch. A piece of this material is placed in position, wings of former A and B standing open, the process being the same as described in connection with Fig. 3.

These formers are used on a temporarily constructed air machine which is described in detail in Fig. 5. It will be seen from this line cut that this makes a very cheap bending machine, which almost anyone can use, providing a supply of compressed air is at hand.

These dies will suggest methods that may be followed by Canadian shops. In the railroad shops, agricultural works, and the many other lines of manufacturing the working of wrought iron is important. These devices illustrate the methods of making duplicate wrought iron parts.

PARALLEL BLOCKS.

The blocks illustrated are of cast iron and are 3x6x7 in. They are cast with four sides. One stud clamps the block and the work to the boring mill.

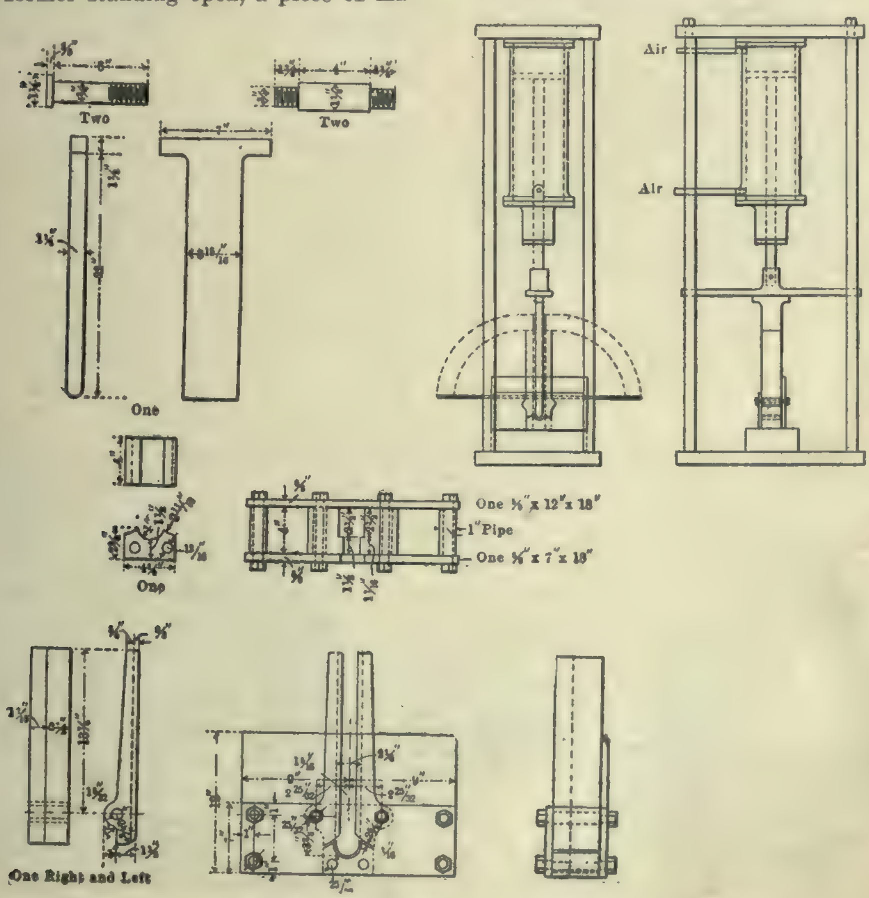
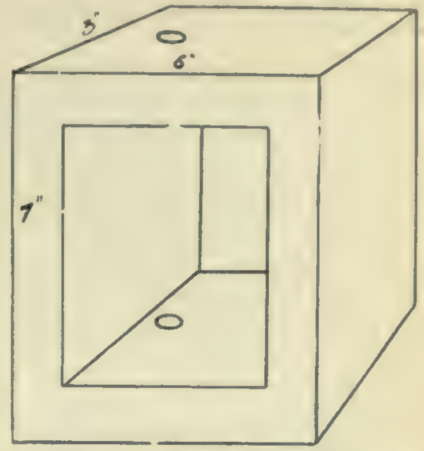


Fig. 6.—A Cheap Forming Press.

Three blocks are necessary for 6-arm wheel. They will handle gears and



Parallel Blocks 3"x6"x7".

pulleys up to the diameter limit of the boring mill and 12 in. in width.

WESTERN RAILWAY CLUB.

A large number of railway men met at the Royal Alexandria, Winnipeg, recently and adopted by-laws and a constitution for what will be known as the Western Canada Railway Club. It will meet on the second Monday of each month, except June, July and August. The following officers were elected: Wm. Whyte, honorary president; M. H. McLeod, G. J. Bury, G. W. Caye, W. Phillips, honorary vice-presidents; Grant Hall, president; L. B. Merriam, first vice-president; W. H. Roseberry, secretary; T. Humphries, treasurer; E. W. DuVal, secretary of committee; R. J. Hungerford, C. W. Cooper, J. McKenzie, Wm. Smith, R. McNeil and L. O. Moody, executive.

CENTRAL RAILWAY AND ENGINEERING CLUB.

The regular monthly meeting was held in the Rossin House, Toronto, on Tuesday, February 16, when an illustrated paper on "The Railway Department of the Y.M.C.A. as a factor in Modern Railway Operations," was read by J. M. Dudley, secretary of the International Committee of the Y.M.C.A.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS.

The Toronto Section of the A.I.E.E. held their regular monthly meeting on January 22nd, in joint session with the Society of Chemical Industry.

J. C. King, of Willson Carbide Co., St. Catharines, presented a paper entitled "Electro-metallurgical Processes." It traced the development of the Electro-metallurgical industry from very earliest dates. The paper was accompanied by a number of drawings of recent designs in electrical furnaces with a full description of each type and present day practices.

DEVELOPMENTS IN MACHINERY

New Machinery for Machine Shop, Foundry, Pattern Shop, Planing Mill; New Engines, Boilers, Electrical Machinery, Transmission Devices.

NEW BATH GRINDER.

A new type of grinder is shown in Fig. 1, the Bath Improved Universal. The frame is of standard construction, but several improved parts have been added. The machine has two power cross feeds, a power feed for cylindrical grinding, and a power feed for surface grinding. The grinder has equipments for plain, surface, internal, disc and cutter grinding of all descriptions.

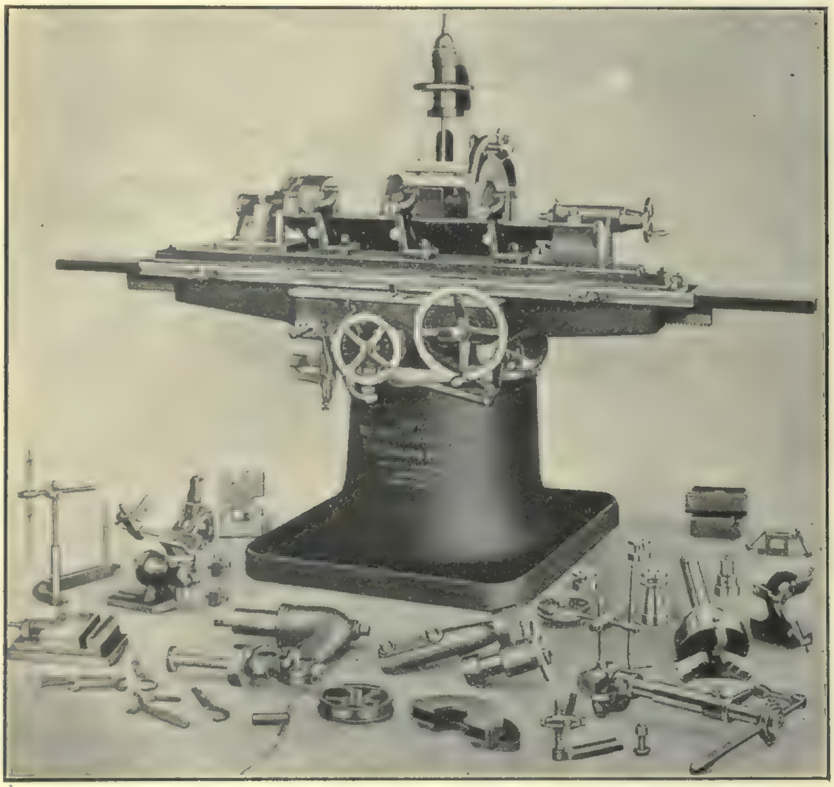


Fig. 1.—New 2½ Universal Bath Grinder with its Attachments.

The apron is seen to advantage in Fig. 2 with the power automatic cross feeds, one for cylindrical grinding, and one for surface grinding, each independent of the other, and both can be disconnected from the cross screw. The feed for cylindrical grinding will feed as fine as .0002, and upwards, and the feed for surface grinding feeds from 1-64 to 3-32, to each stroke of table. The cylindrical grinding feed is equipped with an automatic throw-out, for duplicating work. The reversing mechanism is positive in its stroke, and work may be ground close to the shoulder. The table slide is controlled by a single lever, which reverses the feed in either direction, and starts or stops the traverse movement. By turning the handle at any point of the movement, the table will be stopped at the end of the stroke. The cylindrical grinding feed acts at each end of the table stroke, and the power that operates this mechanism is taken from the mechanism that reverses the table slide from the compressed plunger as shown below the large knurled knob in center of the cut.

Fig. 4 shows the application of parts. In the view at the left the finished bright surface at the end of the spindle head is to take a square or beveled protractor, to accurately place work or any attachment on the machine. Clearance for cutter or reamer grinding and work positions are measured by the combined elevating screw, sliding graduated rod and revolving dial on top of the machine which gives a micrometer reading. The second view shows an extension arbor support for the wheel for surface grinding, form cutter work, snap gauges and similar work where it is more convenient to have the wheel carried away from the spindlehead. The third view illustrates a rigid method of mounting the internal grinding arm in a bore on the side of the machine. The belt is tightened when in motion by turning the hand wheel on the top of the machine. The fourth view shows an easy method of clamping the double ended tooth rest stand to the spindle head with the same screws as are used for the surface arm. The tooth rest comes down from the top and up from the bottom in front, of a disk and cup wheel. In the view on the right the position of the spindle head when used for plain grinding is shown, together with the wheel hood and Wizard water spout.

The view at the left in Fig. 5 demonstrates how a threaded milling cutter

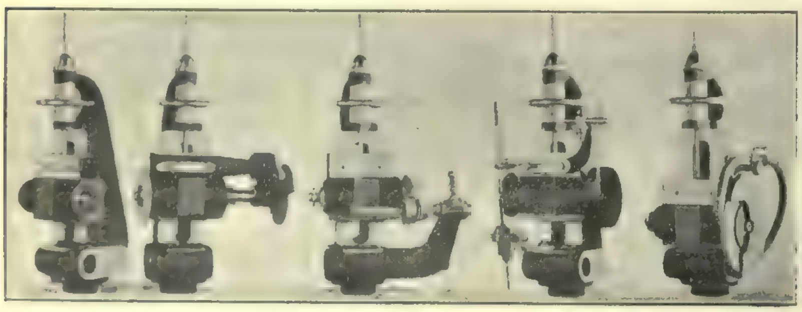


Fig. 4.—Different Uses of Spindle Head.

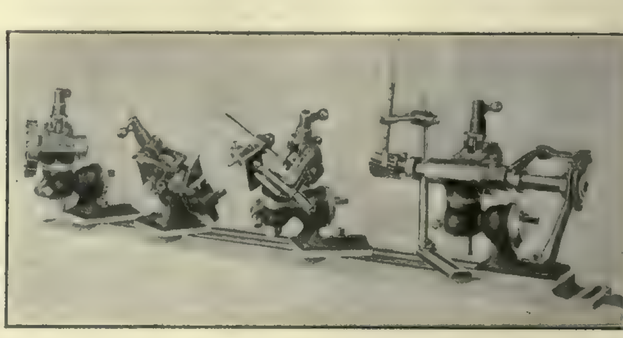


Fig. 5.—Methods of Supporting Work.

may be mounted on an arbor and held in the universal holder for grinding, both In the middle view the chuck is mounted in the holder, and is holding a This grinder is manufactured by Bath Grinder Co., Fitchburg, Mass.

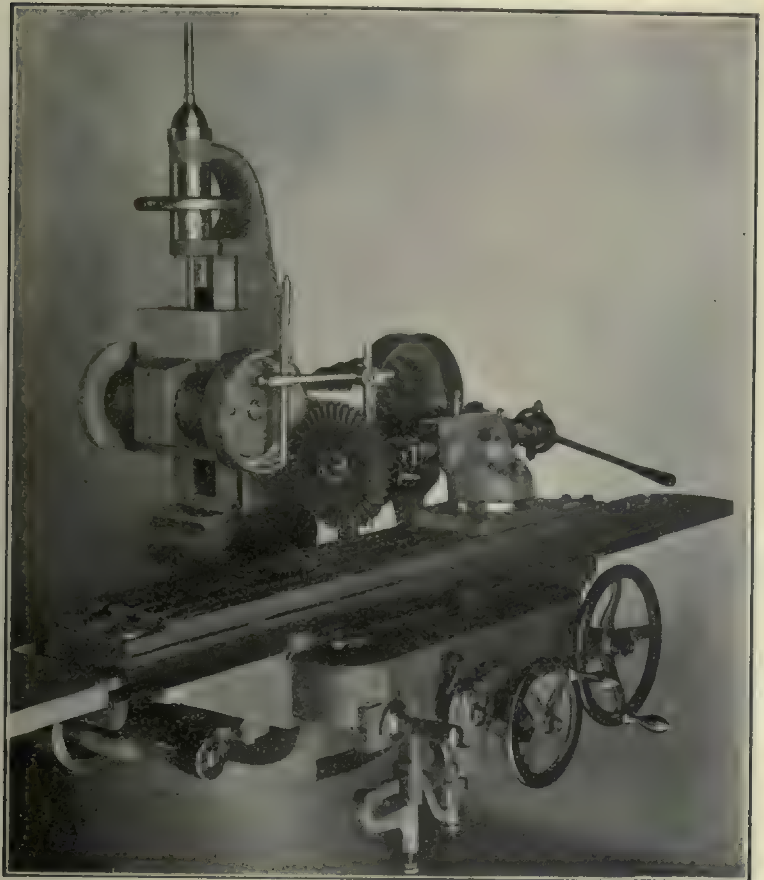


Fig. 2.—Setting for Grinding the Face of a Side Milling Cutter.

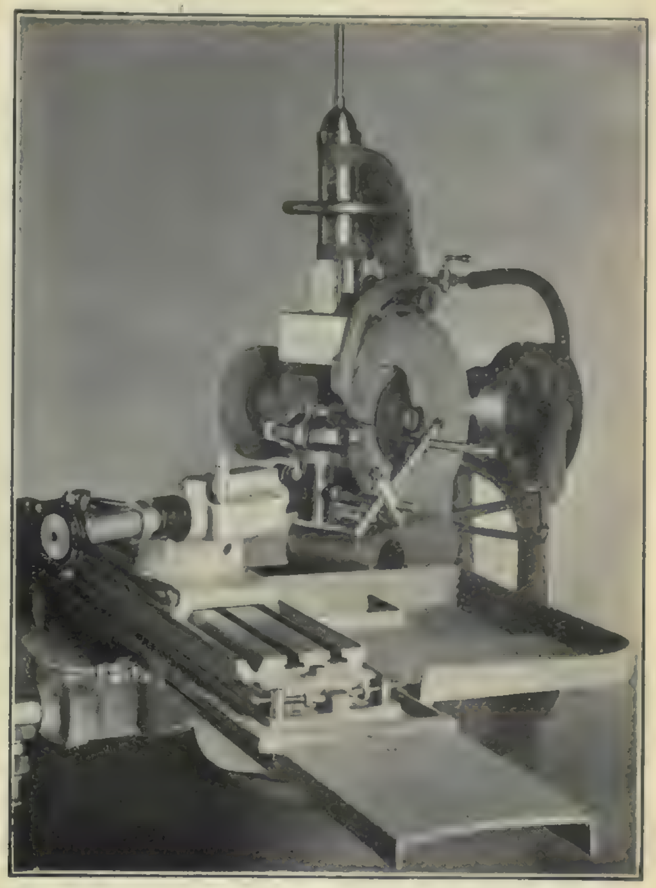


Fig. 3.—Grinding a Large Gear Cutter.

the face of the cutter and the spiral tooth. In the second view a short straight shank is held by one end of the jaw. In the third view a taper shank end mill is held in a V-vise, the jaw being tipped to the angle of the shank. The fourth view shows the method of grinding a spiral cutter with the cutter bar attachment mounted in the universal holder. The tooth rest is tipped to the angle of the spiral.

The left-hand view in Fig. 6 shows the conical bearing. The right-hand view, Fig. 5, shows a milling cutter mounted on a face plate which is held in the universal holder.

In the left hand view, Fig. 7 the chuck is mounted in the V-vise of the universal holder, and it may be seen how it can be swung to an angle. The second view is a suggestive use of the holder, and the third view illustrates the method of holding small cutters in a chuck for grinding. The right-hand view shows the

TRAVELING HEAD FACE GRINDER

A very satisfactory type of traveling head grinder is here illustrated, known as a face grinder. It is particularly adapted to the work of structural iron workers, bridge builders, safe makers and manufacturers in kindred lines, where it is necessary to grind to very exact figures any materials that are liable to be too hard to be machined, such as beams, columns, steel safe plates,

Fig. 6.—Methods of Supporting Work.

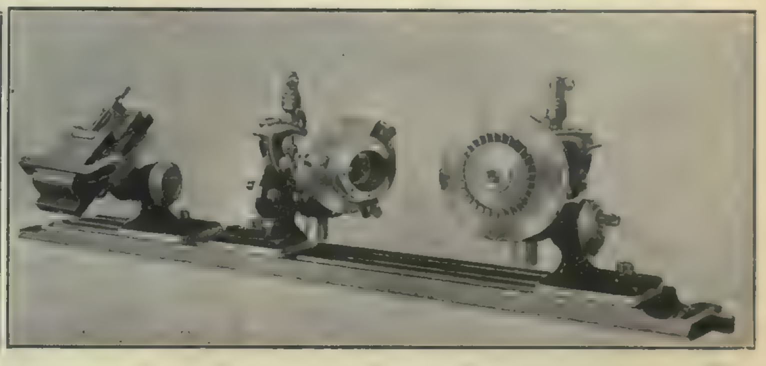


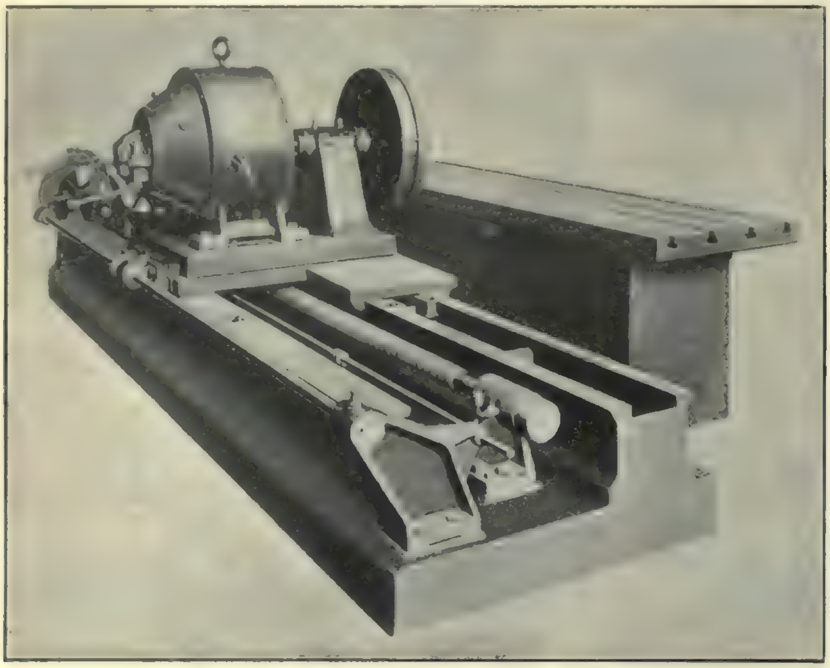
Fig. 7.—Methods of Supporting Work.

horizontal vise and flange plate mounted in the base of the holder. Either can be adjusted independently of the other. flange plate mounted in the socket of the vise, which can be set at any desired angle.

cast iron floor plates, iron stair cases, cast iron fences and railings.

As shown in the illustration, the

grinding head is direct connected to an electric motor, which, together with a very heavy outboard bearing, is mounted



Motor-Driven Traveling Head Face Grinder.

on a large base moving on ways. The motor has an extended shaft to carry the grinder chuck. The work is stationary, being bolted to the large platen in front of the 22-inch emery ring, while the ring rotates and also moves slowly back and forth from end to end of the platen. The reversing is done by a hand lever, when the machine is in use, but automatic stops are provided at each end of the extreme travel, to prevent over-travel should the attendant neglect to reverse the feed. The maximum traverse feed of the grinder is ½-inch, and is operated by a hand wheel and mitre gear on the splined shaft in the front of the machine. The longitudinal travel of the grinder is obtained from the powerful feed screw shown in the illustration. Attention is called to the fact that the travel, 20 feet per minute, is somewhat faster than might be supposed from the thread of the screw as a triple thread is used. The lead screw is driven by a second motor not shown in the illustration.

The grinder is driven by a standard Westinghouse type "S" compound wound, direct current, 10 horse power, 1,100 R.P.M., totally enclosed motor. Where required, an alternating current motor may be supplied in place of the direct current motor. The size of the motor to operate the lead screw is dependent upon the nature of the work to be performed, that is, the amount of metal to be removed.

This grinder is a 102-inch face grinder, as manufactured by the Diamond Machine Company, of Providence, R. I.

JOHN STEPTOE, 16 INCH CRANK SHAPER.

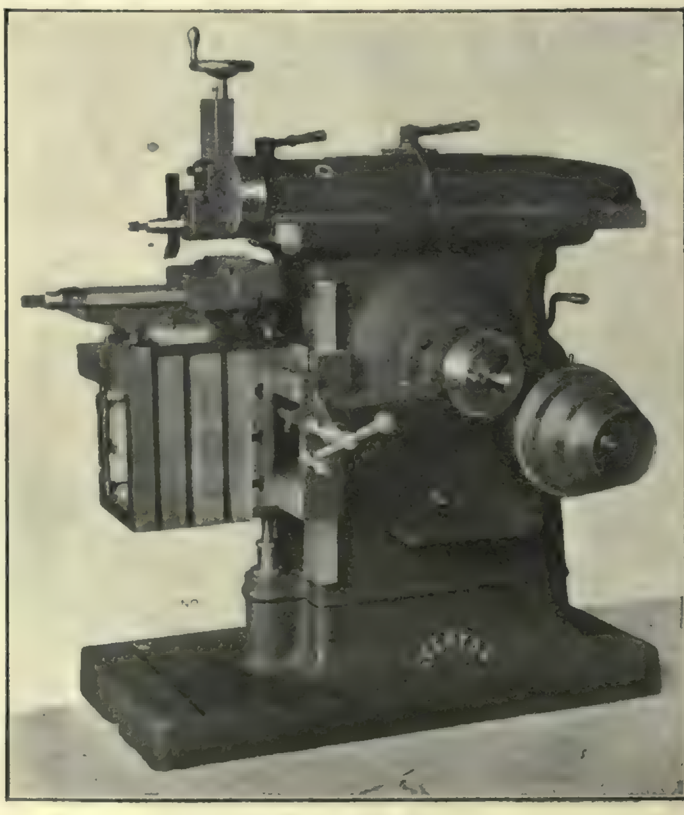
The accompanying cut is that of the new designed John Steptoe Shaper, in which some new features have been incorporated.

The head can be instantly loosened and swiveled to any angle by pushing the lever at the back of the head, and can again be instantly fastened by pulling the lever towards the operator. A stud passes through the center of the harp, and an eccentric stud from the top of the ram pulls the head squarely against the front of the ram.

The length of stroke is secured by means of the lever projecting through the feed plate. This operation can be performed while the machine is in motion. The device in the bull gear is self-locking, and is held firmly in position as soon as the adjusting lever is taken off the shaft, thus avoiding the necessity of locking the shaft in position.

The telescopic screw under the table is fully enclosed, thereby avoiding the possibility of oil and chips getting under the base.

The shaft bearings are provided with cast iron bushings. These bushings are made a tight fit, and are pressed in place. These bushings can be very readily removed, and replaced at any time should it become necessary. The shaft bearings are provided with ring oilers; the ring carrying the oil from an oil well to the shaft, as it revolves. The back geared crank shaper, illustrated above, has a single geared ratio of 6¾ :: 1, and a back geared ratio of about 20 :: 1. The back gears consist of a sleeve to which two gears are attached. The sleeve gears are splined to the shaft, and are therefore constantly running with the shaft.



John Steptoe 16" Shaper.

The feed plate is different from the design usually used. The feed eccentric is pivoted, so that it can be swiveled in any direction. The holes in the plate are drilled and reamed tapered. The stud in the eccentric has a spring in it, and is also tapered. The tapered pin will thereby take up any wear which may occur in this hole. The holes are drilled in a circle, in order to keep them as far apart as possible. They are drilled and numbered in accordance with the teeth in the feed ratchet, thereby making it very easy to secure any desired feed. The ring which encircles the feed eccentric is split, and fitted with a fibre washer, thereby permitting any wear, which may occur in the ring to be very easily taken up by filing this washer.

This shaper is manufactured by the John Steptoe Shaper Co., Cincinnati.

FOLEY AUTOMATIC FILER.

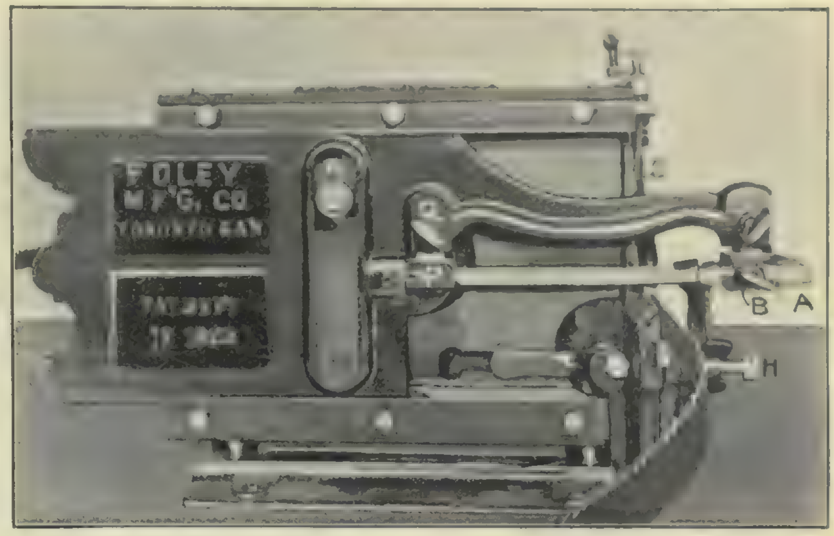
The saw illustrated in the two halftones is a combination automatic filing setting and jointing machine. It can be arranged for a 6" or 7" file by changing the roller in the cam. The three sides of file may be used by turning the bushing.

The vise relieves itself by means of a double cam every time the saw feeds. A regulating device keeps the saw jointed. A special attachment for setting is used when the saw requires setting. It can be thrown out of gear when not in use. A saw may be filed or set independently. The saw set is geared to power wheel and works on a cam motion. The feed can be arranged to feed saw with uneven teeth and set or file them even.

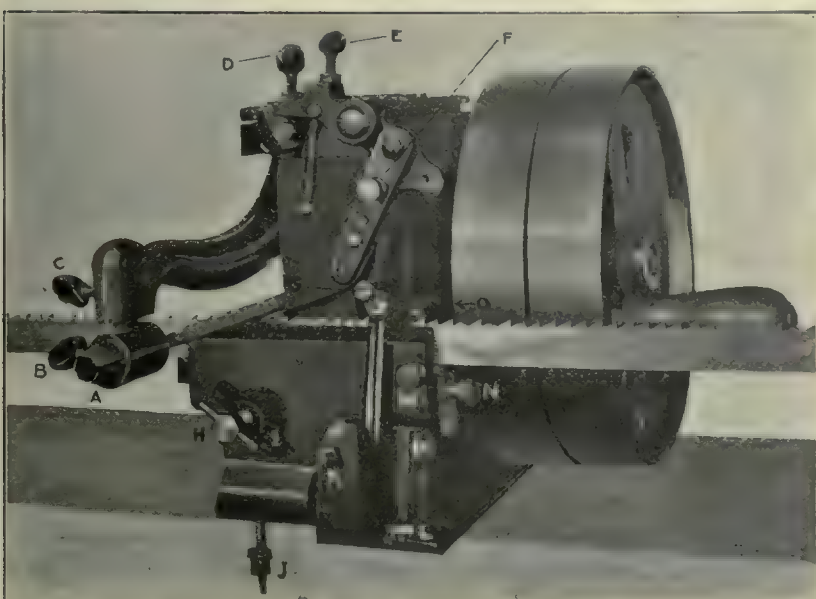
Belt or hand power may be used. By turning the file, the saw may be given an under cut. The frame is raised at an angle allowing the file to be brought out from an undercut.

The working is entirely automatic. Bushings may be replaced to suit any file, slim, extra slim taper file or regular band saw file. The slides or wearing parts of the machine are made of steel and are adjustable to take up the wear.

The parts of the saw are marked so that the reader may understand the construction of the saw and use of parts. A.—Bushing for file, adjustable to any angle; B.—set screw to hold bushing; C. and Q.—raise or lower file; D.—Adjust tooth to file; E.—Adjust dob to take only one tooth; F.—Setting dog for uneven teeth; G.—Adjust set of saw; H.—Lock screw; I.—Nut to lock vise when file is on forward stroke; J.—Raise or lower saw in vise; K.—Set screw to adjust setter to teeth of saw; L.—Screw to raise or lower set; M.—Screw to hold vise steady when setting; N.—Guide to hold saw even when setting; O.—Pin in eccentric to throw set in and out of gear; P.—Bush for tang of file; and R.—Roller in cam to adjust stroke.



Side View Foley Automatic Filer.

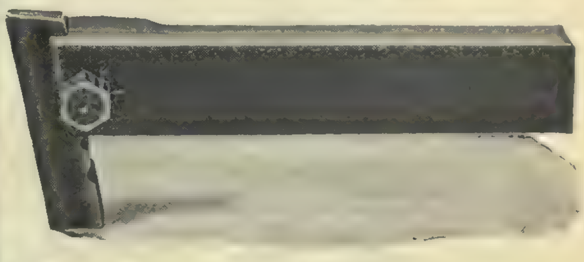


Front View of Foley Automatic Filer.

LANG'S TOOL HOLDER.

This is a 2-in. by 3-in. x 16-in. inserted Tool Holder designed especially to turn Locomotive Tires. This Tool Holder is for removing metal on plain work in the Lathe, Vertical Mill or Planer. It will take a cut on a pair of 72-in. worn Locomotive Drivers of 1/4-in. feed by 3/8-in. depth cut at a speed of from 10 to 15 feet per minute.

The regular cutters furnished are drop-forged, of best 70c high speed steel. The points are air-hardened and ground ready for use. The cutters are 7 inches long and 2 inches across flat and are set in the Holder at 10 degrees front and side clearance. This allows grinding on face as well as top, as 7 degrees is the proper clearance, the face of cutter need only be ground a short distance down from top.


Lang's Tool Holder.

The Holder is made of steel of over 100,000 pounds tensile strength and oil

hardened and is made right and left hand (right hand feeds towards headstock of Lathe.)

This holder is manufactured by G. R. Lang Co., Meadville, Pa.

"USE-'EM-UP" SOCKETS.

The socket illustrated herewith was invented to overcome the loss due to the tangs being twisted from high speed drills.

It will be noted that this socket is similar to the standard taper socket with two exceptions; one, that it has a flat on its inside surface, and the other that the drift slot is somewhat longer than on the ordinary socket, to facilitate the driving out of tangless drills.

With the socket described it is only necessary to grind a flat on the remaining portion of the shank after same has been broken off, or the tang twisted off, in order to put the drill into immediate use, or if a flat is ground on a new drill the trouble of having a tang breaking will be eliminated.

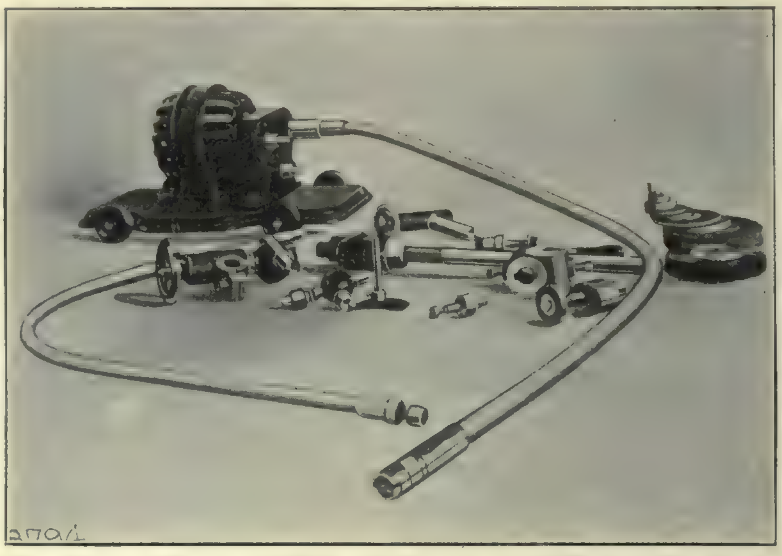
Flattening the drill shank to fit this socket does not in any way interfere with its use in the standard taper socket. This drill is manufactured and sold by the American Specialty Company of Chicago, and we understand the price is very reasonable.

Use-Em-Up Sockets.

SMALL MOTOR-DRIVEN EMERY WHEELS, BUFFERS AND DRILLS.

The illustration shows a handy motor-driven flexible shaft outfit. The equipment consists of a breast drill, drill press, emery wheels and polishers, and is provided with such necessary attachments as a multiplier, clamp, spindle, old-man, etc. The motor is a 1 h.p. Westinghouse type CCL alternating current motor, mounted on a portable truck, and fitted with speed changing head and flexible shaft. The portability makes the appliance convenient for any large work, and the flexible shaft permits the operator to work with ease upon otherwise difficult accessible parts.

In order to obtain the proper cutting speeds for emery wheels of different diameters, multipliers of the proper ratios are used. The two which can be used to best advantage are those having ratios of $8\frac{1}{2}$ to 1 and $6\frac{1}{2}$ to 1 respectively; the former for use with $\frac{1}{8}$ in., $\frac{1}{2}$in. and 1 in. wheels, and the latter for 2 in. and 3 in. wheels. Larger sizes are used on a clamp spindle which runs at the speed of the shaft, 1,800 to 2,500 r.p.m.


Small Motor-driven Emery Wheels, Buffers and Drills.

By removing the breast plate on the drill and attaching a combination old-man, drilling up to $\frac{1}{2}$ in. can be readily done. Larger drills up to $1\frac{1}{4}$ in. are used in connection with a worm feed drill press and old-man attachment.

The outfit is so arranged that a heavy or light shaft can be used according to the requirements of the work. The smaller shaft is fitted with a taper and sleeve for taking small tools, and the larger shaft with clutch sleeve and grab dog clutches, so that one tool can be used after another without making any change in the shaft. The outfit was made by the Coates Clipper Mfg. Co., Worcester, Mass.

NATIONAL DIE SHARPENER.

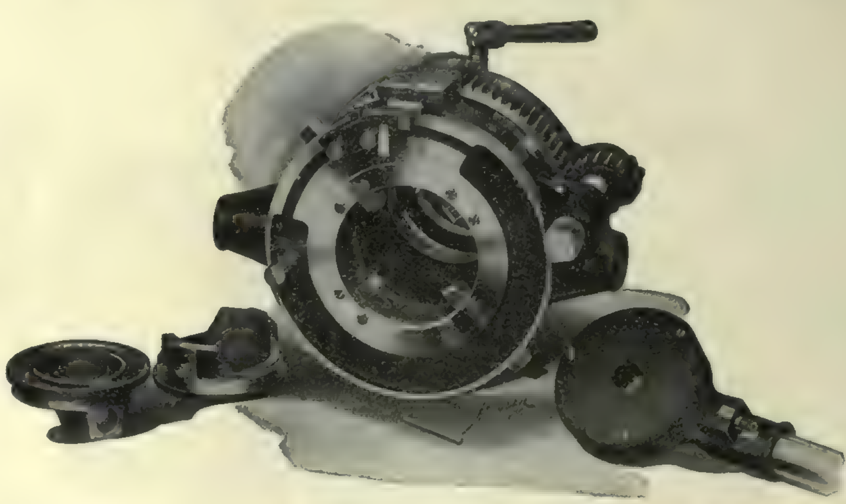
This machine is intended for sharpening Bolt Cutter dies, giving them the proper entrance and correct clearance. It is simple in design. A 6'' wheel is

It will sharpen. any size or type of threading die.

used, which can be redressed to 3½'' without affecting the machine's operation. A suitable chart is furnished for making the necessary settings for various diameters, and may be changed from one size to another.

This new Die Sharpening Machine was recently brought out by the National Machinery Company, Tiffin, Ohio, manufacturers of bolt and nut machinery.

The man who trusts to his cunning for success is next door to a thief.


The National Die Sharpener.

One cannot travel very far within, without progressing outward.

Although genius may occasionally exhibit eccentricity—eccentricity does not imply genius.

POWER GENERATION AND APPLICATION

For Manufacturers. Cost and Efficiency Articles Rather Than Technical.
Steam Power Plants ; Hydro Electric Development ; Producer Gas, Etc.

DALLETT AIR COMPRESSORS.

These compressors incorporate the essential features of having all parts requiring adjustment or renewals readily accessible, and using a liberal amount of metal, to insure rigidity in operation.

The frame is of the Open Fork center crank type, and designed to obtain on each size compressor a greater range of capacity by substituting, when desired, a cylinder of the next larger size than the standard to operate at 100 lbs. pressure. For example :— On an 8" stroke compressor, the regular cylinder for 100 lbs. pressure is 8" in diameter, but a 10" diameter cylinder can be substituted and still operate at the above pressure, whereby a greater volume of air is obtained with but a slight increase in cost of machine.

The cross head guides are cylindrical and are bored at the same setting as the boring and facing of the end which receives the cylinder, insuring absolute alignment. Lubrication is effected by means of sight feed devices, or by gravity or force feed system, as desired, and drains are provided for draining off all drippings from guides, stuffing boxes and crank pit.

The duplex belt, duplex steam and single steam machines are supported on a rigid and deep sub-base, thus making the entire machine self-contained and insuring satisfactory operation on either a rough temporary foundation of timbers, or a permanent one of concrete or brick. An oil gutter is provided entirely around the lower base flange on all sub-bases.

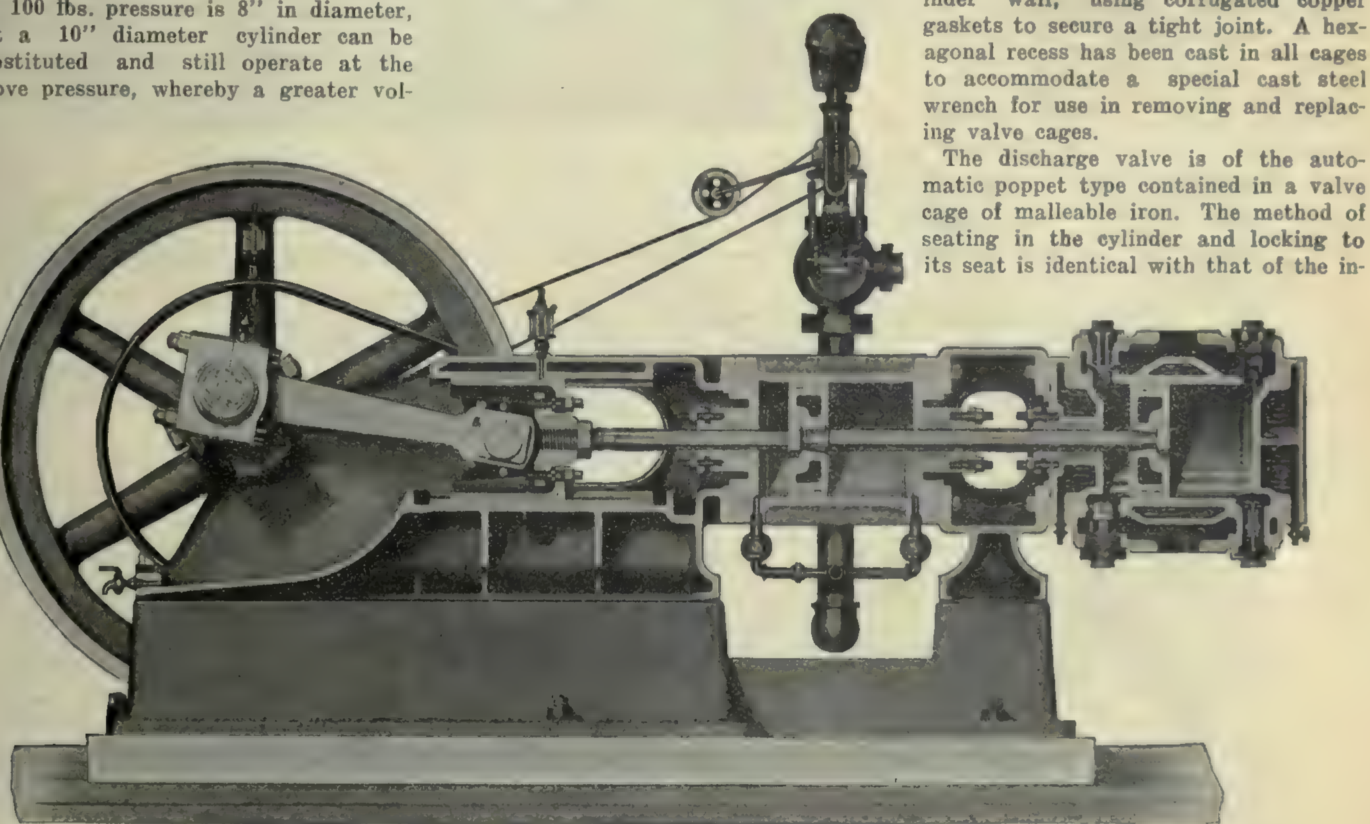
The steam cylinder and valve gear of the steam driven machines are examples of up-to-date steam engine practice, giving high efficiency. All steam ports are short and direct and of the proper area. The clearance has been reduced to a minimum, giving an appreciable saving in steam consumption. A plain D balanced slide valve is used on the small and medium sized machines ; the Meyer balanced adjustable cut-off valve being employed on the larger machines. To provide efficient heat insulation, all steam cylinders are lagged with mineral wool and neatly jacketed with planished sheet steel.

The rocker arms on all valve gears are provided with means for adjustment. On every steam driven machine the governor is equipped with a safety stop device, which immediately stops the machine in case the governor belt should break.

Mechanically operated inlet valves are supplied on any size compressure desired. These valves are ground to gauge and the valve holes lapped to size.

The intake valve is of the automatic poppet type, contained in a malleable iron cage. The cage is one piece and combines both seat for the valve and guide for the valve stem. The cage is threaded and screws into the wall of the air intake chamber only, and is simply seated in a recess on the main cylinder wall, using corrugated copper gaskets to secure a tight joint. A hexagonal recess has been cast in all cages to accommodate a special cast steel wrench for use in removing and replacing valve cages.

The discharge valve is of the automatic poppet type contained in a valve cage of malleable iron. The method of seating in the cylinder and locking to its seat is identical with that of the intake valve. A projection or boss has been provided on the valve cap, which acts as a positive stop for the valve when it has reached a lift, giving a full opening area, and does away with fluttering. This same projection on the cap also acts as a spring guide for the valve spring.



Sectional Elevation of Single Steam Machine.

The compressors described are built by the T. H. Dallett Co., Philadelphia, in sizes from 8" stroke up to and including 16" stroke, and give a range of capacity from 79 cu. ft. of free air per minute to 1200 cu. ft.

The Application of Chain Drives to Machine Tools

Second Article Showing its Use in Driving Other Machinery, Such as Blowers, Hammers, Counter Shafts, Line Shafts, Etc. — A Consideration of Chain Drive Efficiency.

Last month we took up the origin and growth of driving chains, showing the different types, including the silent chain. The article also contained a

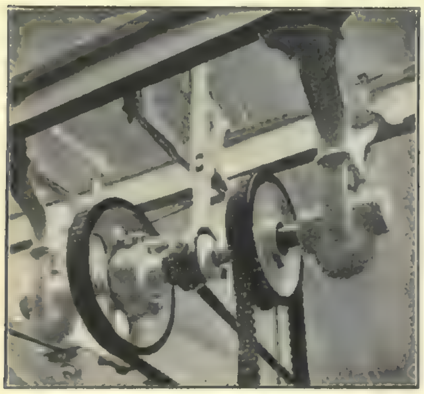


Fig. 1.—Coil Clutch Arrangement.

short description of the shops of Hans Renold Ltd., who were the originators of the chain.

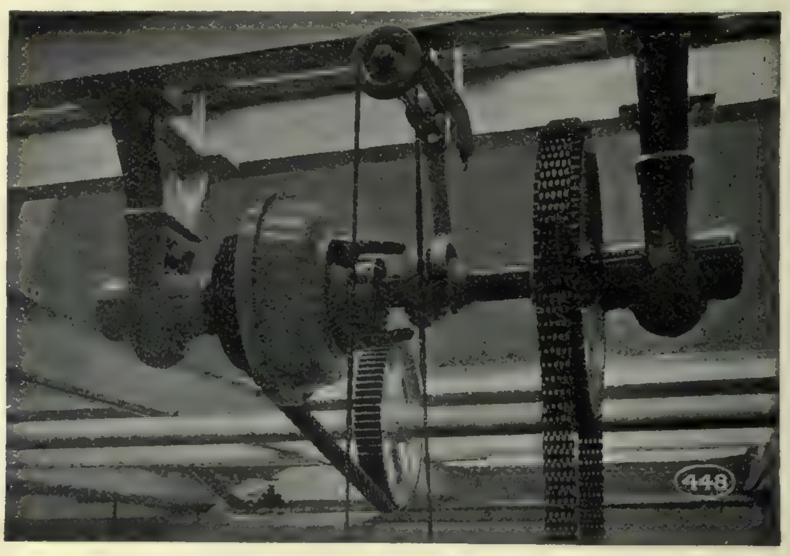


Fig. 2.—Countershaft with Cone Clutch.

Fig. 3.—View of Line and Countershafting.

Like all new methods and appliances, chain driving has had its opposition from those who are over cautious and conservative about throwing out older, but still satisfactory, methods of drive to take on the new. First cost of chain drives, too, has been an important factor in the opposition, but this has been reduced by the inovation of modern machinery for their manufacture. In some instances, where it has been impossible to use belt or gear drives, the use of the chain has been made imperative.

In the new work of Hans Renold Ltd., chain driving is almost exclusively used, in fact, to such an extent as to raise the question as to whether the extensive use is due to over enthusiasm or to economical reasons. The use of chain makes an economical system of drive

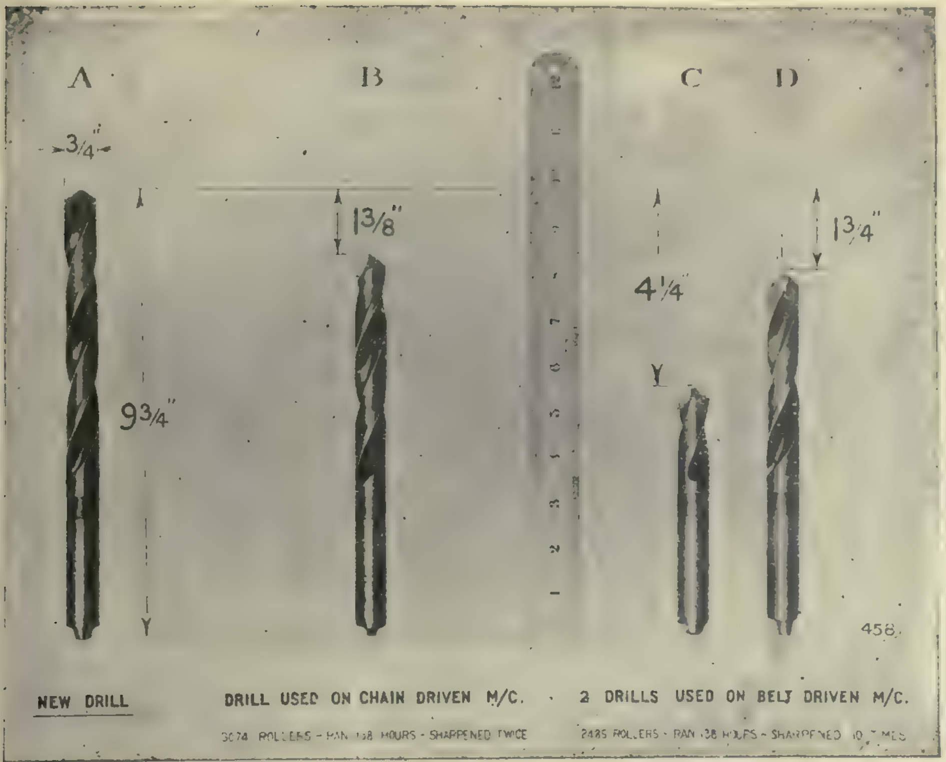


Fig. 4.—Drills Used in Automatic Mac hines.

and the results of several experiments made on a few of them are included in this article.

Countershaft Drives.

Typical countershaft drives are shown in Figs. 1 and 2. The shafting can be very easily rearranged as the hangers are clamped to the beams and not balked through. This arrangement is evident in Fig 1, which shows the clutch used on machines taking not more than 3 or 4 horse power. The

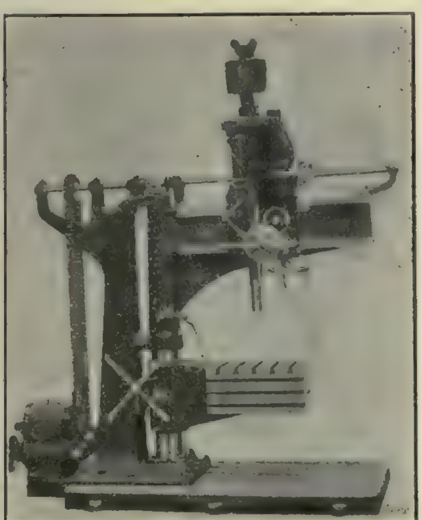


Fig. 6.—Chain-Driven Radial Drill.

clutch is of the coil type and is actuated by a lever moved by an eccentric pin, which works in a slot through the lever. Rods or chains, hanging down within reach of the machine operator, rotate a pulley fixed to the shaft which carries the eccentric pin. The engaging gear is better shown in Fig. 2. This shows a cone clutch, which type is used on drives above 4 horse power. The clutch is completely enclosed and is provided with well oiled, self contained thrust bearings. Fig. 3 shows the shafting over one of the automatic bays in the Renold shops. Some of these very light machines are driven by belts but the spindles of the larger ones are driven by chains. It will be noted that the machines, shown in Fig. 3, are set at an angle to allow the stock in one to clear the bed of the next. This angle seems not to interfere in the least with the running of the chains.

In considering the change from belts to chains records of the operations, increase or decrease in output, etc., were carefully kept and the results will be interesting. In this particular arrangement of "automatics" a saving of over 20 per cent. in the power bill was made, and the output increased from 15 to 25 per cent. Regarding the quality of the work turned out, it was found that it was better. The tools had a longer life which, of course, had a direct effect on the output. It was also possible to

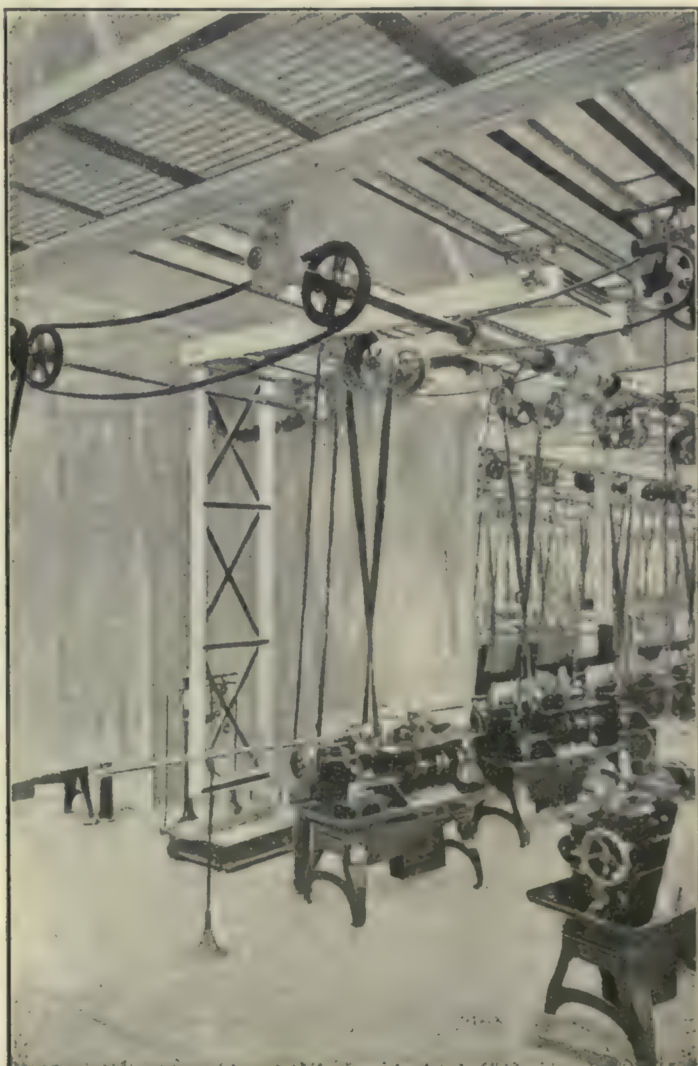


Fig. 5.—Methods of Testing Tension in Belts and Chains.

accommodate a greater number of machines and the shop is quite as silent as a belt driven shop. Overhead light and space are saved, on account of the chain sprockets being from 50 to 80 per cent.

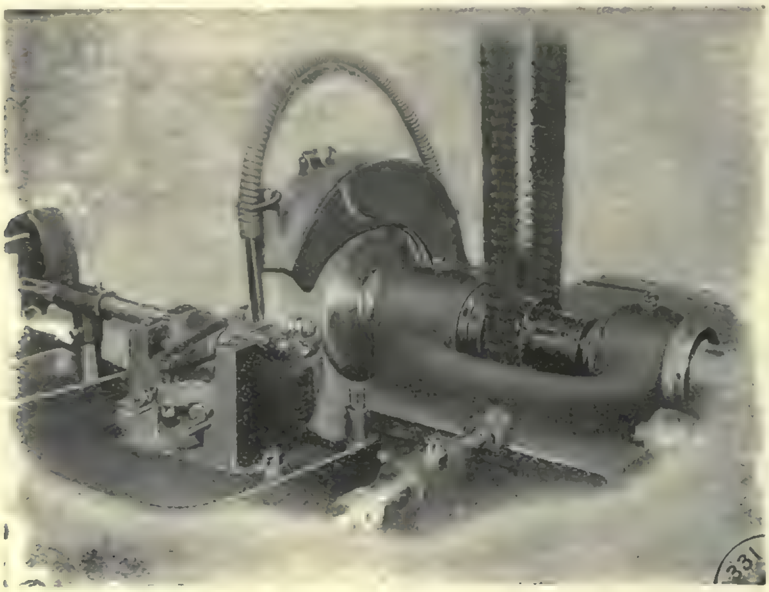


Fig. 7.—Chain-Driven Grinding Machine.

less in width and from 30 to 50 per cent. less in diameter than belt pulleys.

In first cost the belt arrangement had the advantage of being about $1,000 cheaper than the chain instalation. Assuming that there is no difference in the depreciation and maintenance charges for chains as against belts, the total annual cost of running the department amounts to about $30,000 per year. Now it has been found that chain driven au-

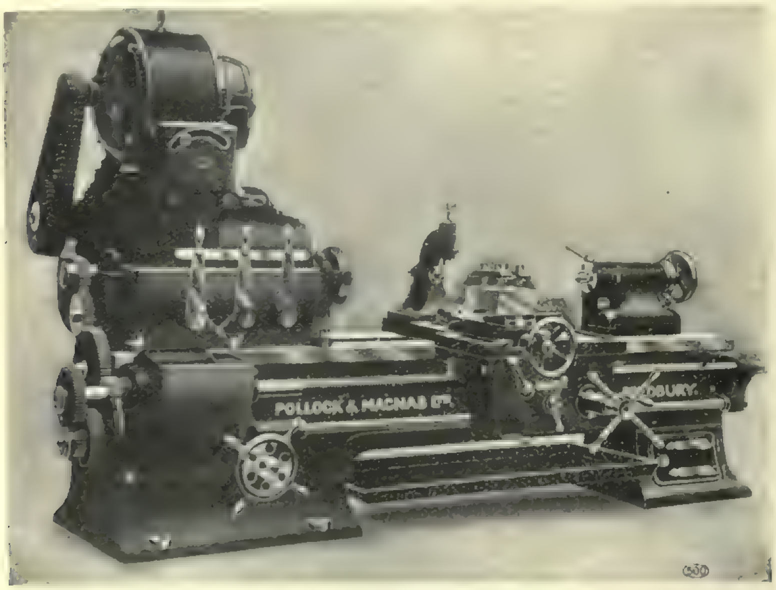


Fig. 8.—Chain-Driven Lathe.

tomatics effect a saving of at least 75 per cent. in the cost of tools and that chains have about three times the life of belts. It was also found that a group of chain driven automatics had a larger output with two operators than the same group had previously with four. The interest on the difference in first cost is negligible compared to the total shop charges, the increased production and other benefits obtained giving a good balance on the right side.

Fig. 4 is a photograph of drills used in the trials of the automatic lathes and is self explanatory. In a trial of the automatic lathes, lasting 138 hours the records were as follows: On the belt driven machine the circumferential speed of $\frac{3}{4}$ in. drill was 93.75 ft. per min., the feed per revolution, .0028 in., and the drill was ground 10 times; the speed of the chain driven drill was slower, being 56.25 ft. per min., the feed greater, being .0046 in. per rev. and the drill was ground only twice.

In investigating the effect of the use of both chains and belts on the bearings of the machines Fig. 5 shows how the tension was measured. The weight of 23 feet of chain used was 32 lbs. and that of the same length of $2\frac{3}{4}$ in. leather belt, 5 lbs. The small screw jack seen on the scales platform was used to give the desired tension by raising the frame holding the counter shaft. The pressure due to the chain did not exceed 68 lbs. on the counter shaft nor 36 lbs. on the machine spindle.

Machine Tools.

In Fig. 6 is shown the spindle drive of a radial drill. A considerable amount of power must be transmitted in cases like this especially at the low speeds. A belt drive would, in this instance, have to work at such a tension as to be hard on the bearings, whereas the chain would put no pressure on the lower bearing and only the pressure due to the weight of the chain on the top box. On grinding machines, one would hardly suppose chain driving would be suitable, yet the emery wheel shown in

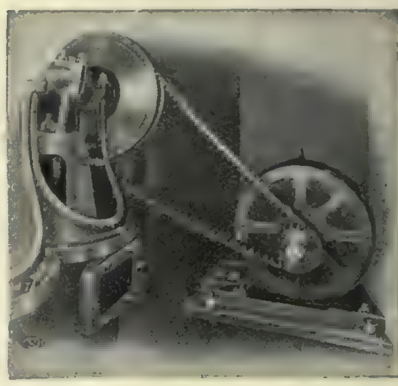


Fig. 9.—Springwheel Drive on Pump.

Fig. 7 has been driven for several years and has given the best of results. The feed works of this machine are driven by roller chains.

In the minds of some people, the idea exists that the positive drive of the chains is liable to cause accidents to machines by not giving or slipping, as a belt would when a sudden load is applied. The possibility of such occurrences is eliminated in different ways. On motor drives an automatic cutout is connected with the feeders that cuts out the current when a definite load is exceeded. Another method is to use a sprocket, the rim of which turns freely on its hub. The tongue is transmitted through a pin graded to suit the power required and which is sheared off by the application of excess power.

Fig. 8 shows a motor driven lathe for heavy work. If the motor and head shack are made sufficiently strong the lathe will remove as much metal as the tool can be made to stand.

Other Drives.

In pulsating loads such as occur in pumps (see Fig. 9) a spring sprocket is used. The construction of such a drive is clearly shown on page 54 of the February issue of Canadian Machinery. The springs, acting under compression between the boss and the rim, absorb irregularities in the load and save the chain from the tendency to shake to pieces. The armature of the motor is also profited by this cushioning.

The two large fans shown in Fig. 10 are used for heating and ventilating the works of Hans Renold Ltd. The motors run at 720 r.p.m. and the fans absorb about 20 horsepower each. It will be noted that the centres are short which economizes considerable floor space. The chains run very slack which is beneficial to the bearings and reduces the wear and tear on the machines to a minimum.

Fig. 11 gives one a good idea of the size of some of the larger silent chain drives. In this illustration the sprockets are of the spring cushion type. These chains are used in a coal mine, to transmit 200 H.P. from electric motors to hauling drums.

Two chains run side by side on a set of wheels (200 H.P. per set), the lineal speed of the chains being 1,170 ft. per min., the pinions make 286 and the spring wheels, 74 revs. per min.

There are many more individual cases of chain driving that might be mentioned would space permit, but the above will serve to show the strides that have been taken in the development of this type of drive. Of course it has its limitations and there are many cases where it would be impracticable to employ it. For such cases, the older ways of driving by belt, rope or gears will probably always hold.

Fig. 10.—Chain-Driven Fans.

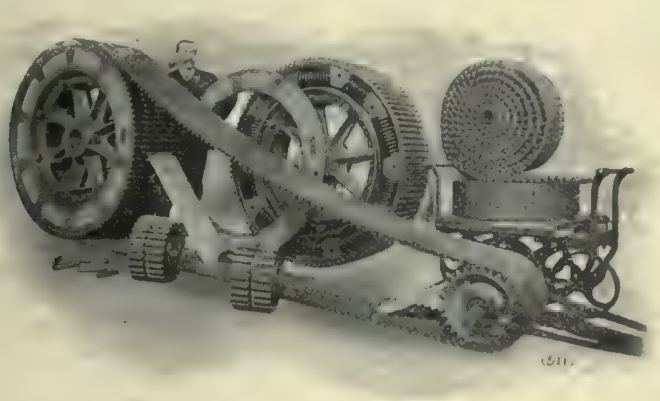


Fig. 11.—Drives of 528 h.p. for Coal-Handling Plant.

Several large instalations of chain drive have been made in Canada and in our next issue we shall give a description of some of these as being of interest to those contemplating the use of this form of transmission.

TORONTO ENGINEERING CLUB.

Mr. J. E. Parsons, B.A., gave an interesting address at the Toronto Engineers' Club last evening upon law as applied to contracting and engineering work. His address was based upon the various legal responsibilities of parties entering into a contract.

Thomas Reid, identified as sales manager of the John Bertram & Sons Co., for many years past, has moved his headquarters to Montreal where he will be associated with The Canadian Fairbanks Co., the general sales agents of the Bertram Co. On account of the importance of the Montreal machine tool market, this move is evidently an advantageous one to both the Bertram Co. and The Canadian Fairbanks Co.

One reason for incompetence is the practice of working at one thing while thinking about another.

CANADIAN RAILWAY CLUB.

The regular monthly meeting of the club took place in the Windsor hotel, Montreal, Tuesday evening, February 2nd. After the routine business was disposed of a paper on "Locomotive Springs" was read by J. A. Kinkead, of Parkesburg Iron Co.

The paper opened with a short history of the earlier researches into the strength and action of semi-eliptic and elliptic springs.

Emphasis was laid on the fact that spring makers and users sacrifice flexibility for strength. "Springs are used in construction on account of their flexibility and within limits their value varies directly as this property. Great care is taken to see that springs are the right width, length, height or strength, while little or no attention is paid to their prime function, flexibility. It sounds unreasonable to say that many spring failures are due to excess strength but such is the case. In all cases of spring failure the flexibility should be carefully checked up, and where the calculated load divided by deflection exceeds 15,000 lbs. substitutes longer springs or thinner plates. One instance which bears out the above assumption was where four leaves were added to a spring, one at a time, as it was thought that failure was due to weakness. With each additional leaf the failure increased.

Accompanying is the "Spring card" of the American Locomotive Company. "Spring tables for semi-elliptic springs give the capacity of one plate one inch wide and different thickness.

To obtain the required number of plates, multiply the figure given in 'Load' column by the width of spring in inches and divide the required capacity by the result. The quotient gives the number of plates required.

Note.—Where quotient gives decimal more than 3 add one plate to the whole number.

The number of full length plates must be 25 per cent. of the whole number required ; other plates must be regularly shortened.

SPRING TABLES
SEMI-ELLIPTIC SPRINGS

ONE PLATE 1" WIDE

Length between centers	1/4" Plate		5/16" Plate		3/8" Plate		7/16" Plate		1/2" Plate	
	Load	Deflection	Load	Deflection	Load	Deflection	Load	Deflection	Load	Deflection
20	167	98	260	.78		..	..	.		
22	152	1.19	235	.95	341	79	..	.		.
24	139	1.41	217	1.13	312	.94	..	..	..	.
26	128	1.66	200	1.32	288	1.10	393	.95	.	..
28	119	1.92	186	1.53	268	1.28	365	1.10	..	.
30	111	2.20	173	1.76	250	1.47	341	1.26	.	
32	..	..	163	2.00	234	1.67	319	1.43	..	.
34	..	..	153	2 26	220	1.88	301	1.62	..	
36	..	..	144	2.53	208	2.12	284	1.81	372	1.53
38	..	..	..	..	197	2.35	269	2.03	350	1.76
40					187	2.60	255	2.24	333	1.95
42					178	2.87	243	2.47	317	2.16
44					170	3.15	232	2.71	303	2.37
46					163	3.45	222	2.96	290	2 58
48					156	3 75	213	3 22	277	2.82
50							204	3.49	266	3.06
52							197	3.78	256	3.30
54					.	.	189	4.08	247	3.57
56									238	3.83
58					..			..	230	4.12

Formulae used in Computing Table

$$P = \frac{53333\ H^2}{L}$$

$$F = .000611\ \frac{L^2}{H}$$

P = net static load
F = deflection
H = thickness of plate
L = length between centers

The deflection given in table is the difference between free and loaded height irrespective of width or number of plates; for full elliptics number of plates and deflection given is for each half of spring."

C. S. OF C. E., MONTREAL.

A meeting of the electrical section was held on Friday evening, February 11th. J. A. Johnson, of the Ontario Power Co., Niagara Falls, gave an interesting description and demonstration of the Oscillograph. This is one of the latest instruments to be devised to measure or demonstrate the alternations in alternating currents.

The principle used is the passing of the current in opposite directions through two parallel wires. Across these wires is fastened a tiny mirror upon which a ray of light is focussed. The current causes this mirror to turn backward and forward through a certain arc and the movement of the reflected point of light is photographed on a film fastened to a revolving drum. For ocular demonstration the movement of the light is shown on a ground glass plate.

The lecture was made more interesting by the lantern slides which showed, besides the construction of the instrument, a number of photographs of different alternating current phenomena occasioned by short-circuiting, circuit breaking, etc., etc.

The lecture took place in one of the lecture theatres of the Macdonald Engineering Building, McGill University, on account of the ease with which the various electrical connections could be made.

A. F. A. ANNUAL CONVENTION.

A meeting of foundrymen, supply men and others was held at the Sinton Hotel, Cincinnati, Wednesday, January 27, to arrange the preliminaries for the convention of the American Foundrymen's Association and allied bodies in the week of May 17. James A. Green, of Matthew Addy & Co., was made chairman ; William Gilbert, Buckeye Foundry Company, treasurer, and W. L. Finch, secretary. The following committees were appointed : On Hall—John Hill, John J. Bruce, Justus Thorner, F. W. Weissman and H. Black, also an officer of the Foundry Specialty Company. On Entertainment—J. K. Pollock, James A. Green, Harry Frohman, Frank M. Eaton and John Sargeant. On Finance—George McG. Morris, Theo. Bollman, Walter Geler, Lew Walter and Fred Brunner.

Dr. Moldenke, the secretary, can be reached at Watchung, N. J. W. M. Corse is secretary of the American Brass Founders' Association. His address is 123 Palmer Ave. E., Detroit.

C. E. Hoyt, secretary of the Foundry and Manufactururers' Supply Association and of the American Foundry Foreman's Association is confident that this convention will be the best yet held.

The Cincinnati Convention promises to be a big event.

It will pay Canadian foundrymen to attend the convention and see the large exhibits of up-to-date foundry equipment. Papers along various lines of advancement will be read and the exchange of ideas will bring out many ideas for improvements in foundry practice which progressive Canadians cannot afford to miss. Let as many as possible join the crowd at Cincinnati in May.

CANADIAN MACHINERY AND MANUFACTURING NEWS

A monthly newspaper devoted to machinery and manufacturing interests mechanical and electrical trades, the foundry, technical progress, construction and improvement, and to all users of power developed from steam, gas, electricity, compressed air and water in Canada.

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Vol. V. MARCH, 1909 No. 3

"GOOD ENOUGH" NOT "GOOD ENOUGH."

A mechanic was working on a pattern for a binder and on the completion of his task was heard to remark, "It is good enough." That should not be the question. Are you satisfied with your work? Can you improve it? The self-satisfied man who considers his work good enough will never reach the top of his trade. No good pattern maker ever reached a position of trust by doing his work in a slip-shod fashion. A workman's proudest boast is pay honestly earned for work well done. Everything must be best possible. Poor work is dear at any price.

A good foundation for a reputation in the shop or office is the motto we have given. It has been the basis of success of many strong concerns. It is equally applicable to individuals for on individuals depend the reputation of his company. If a man is content to turn a spindle for a grinder within one-sixteenth of an inch of "snug fit," and say it is good enough he need not be surprised if his company earns the reputation of placing poor and "chattering" tools on the market. Such a mechanic is building for himself and his company an unenviable reputation.

"Good Enough" not "Good Enough" is an industrial battlecry that might well be adopted by workmen and manufacturers. If accurate and careful workmanship is not insisted upon the company must give place to others where thoroughness is the keyword. In the latter establishments mechanics must line up to the motto, "Good Enough" not "Good Enough," or they will find themselves passed over by those who do their best,—who take pains to do things accurately and thoroughly.

SPRINKLER SYSTEMS.

The Heavy cost of installing automatic sprinklers for fire fighting has to a large extent militated against their instalation up to date. This cost is attributable to the expense of submitting provisional plans and providing for inspection and also to the exacting demands which are made by the companies as to the character and extent of the equipment. Sprinkler contractors have in the past had to send a representative to inspect, measure and lay out equipment, and the aggregate cost of three or four contractors doing this service must be added to the general cost of the business.

The insurance department of the Canadian Manufacturers' Association has established a department to act in the capacity of an architect to concerns desiring to install sprinkler systems, their draughtsman preparing one set of plans and uniform specifications on which the sprinkler contractors will be asked to submit tenders. Besides preparing plans and specifications, the department will superintend the erection of sprinkler systems under the regulations of any existing insurance organization. A saving, it is said, can be effected in this manner of from $200 to $500 for each installation, and this should result in a substantial increase in the number of instalations.

Another fact of importance is that modified systems of sprinkler protection involving much less cost and carrying reductions in rates are receiving the attention of the department. There are many manufacturers who are not prepared to install these systems up to the exacting demands of the companies, but would readily provide a more modest outlay in consideration of receiving commensurate benefit.

TAKING CARE OF INJURED WORKMEN.

We often hear of soulless corporations who take no thought of the workmen who are the producers that make profits possible. The workmen toil at the anvil, forging the red hot iron into various shapes; they work at the lathe, or other machine, producing work quickly and accurately; they stoop daily at the task of molding, preparing the sand to receive the large ladles of molten metal, or carry on some other responsible task.

It is the work produced by these men who build up the reputation of a company, and it is a pleasure to note that one large corporation, at least, contains a human element that is touched with the moral responsibility it owes to faithful employes. Whether or not this corporation referred to was legally responsible for an accident that occurred in its works a short time ago the men at its head are to be commended for the liberality and promptness displayed in taking care of an injured employe.

We refer to the Hamilton Steel & Iron Co., who were commended by Justice Teetzel recently for its system of looking after injured workmen. John Southorn, an employe, who was severely burned with molten metal, sued for $10,000 damages. An agreement was arrived at, but Justice Teetzel said he was surprised to find the company so generous in providing for an injured workman as instanced in the case.

FOUNDRY PRACTICE AND EQUIPMENT

Practical Articles for Canadian Foundrymen and Pattern Makers, and News of Foundrymen's and Allied Associations. Contributions Invited.

METAL MARKETS.

The markets have not been very staple during the month, a decline taking place both in tin and copper. Jobbing trade has been very good, showing an improving tendency all through, but weakness in the primary markets caused prices to sag despite the trade doing. Metal users have found orders generally coming along freely with the result that they have bought in larger quantities although keeping well within their immediate wants. Inquiries have been good, and there is no doubt that consumers are watching the markets closely. So far as large contracts are concerned business has been quiet, and there has been no great desire to stock up. Specifications are now being received on contracts placed some time back, and shipping is becoming more frequent as industrial activity increases.

Owing to weakness in the English tin market, prices were cut [illegible] during the month to ½c. which made the jobbing price around 31½c. Tin struck a snag during the early part of the month. The knowledge that there was plenty of metal on the market, and that stocks were heavy, brought about a strong bearing movement in London, and although at that time tin should have been showing much better strength, figures fell away. However towards the end of the month the bulls became active again, and prices rose. It may be that the tin market is in for another spell of bull controlling. If so Canadian figures will follow. Copper during the month received a cut of ¼c making jobbing prices around 15c, with shading for large sized orders. Copper has not been in a very healthy state in New York. Consumers have kept off the markets, and there is a strong movement on foot to bring about lower prices. The English market has not been strong, and this has helped the bear operators. Producers are still not seeking business, and stocks must be piling up. It is a strange fact that at a time when iron and steel production has been kept down, copper should be worked at record speed. It seems to be a contest of endurance between the producers on the one hand and the consumers on the other.

The pig iron and steel situation in the States seems in a depressed condition. Cutting has undoubtedly been going on in pig iron and in finished steel articles excepting rails. The Steel Corporations are maintaining prices, but many of the independent firms are cutting to get business, and in some measure succeeding. Undoubtedly there is not the business showing that was expected. Canadian furnaces continue to hold prices well, and are reported as being busy. Conditions in the Old Country were inclined to show weakness at the commencement of the month but the recent rise in Consols, and the general impression that trade is on the mend, have improved matters, and a stronger tone is now reported in pig iron and steel.

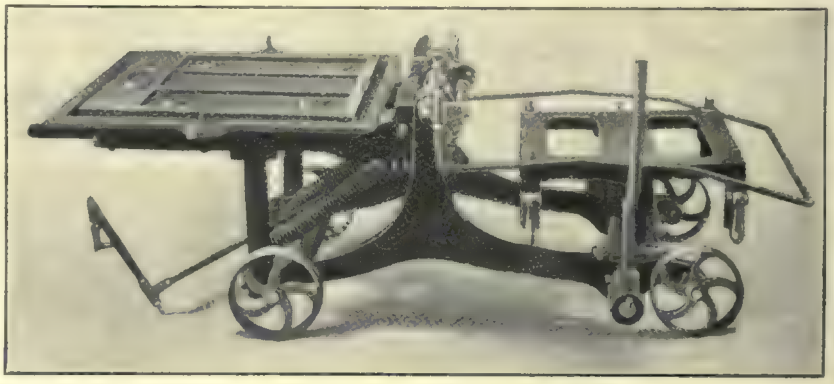
Spelter has not changed during the month, and we continue to quote \$5.50. Trade has been steady, and the market appears to be in a very sound condition. Prices in the English market have kept remarkably firm, and the metal seems as strong as ever. At St. Louis there has been a slight weakness, but nothing to speak of after the way in which the prices have held. In the circumstances, a reaction is only natural. Lead at the commencement of the month in the English market was on the weak side, but later on the market improved very much, and figures rose again. The result was that lead in the Canadian market advanced 10c., and jobbing prices for imported lead became around \$3.80 with Trail at \$3.70.

OSBORN MOLDING MACHINE.

The Osborn rock-over down-draft molding machine was developed in the foundry of the Best Foundry Co., Bedford. This machine drops the mold away from the pattern—a straight gravity drop—that it is provided with a simple automatic adjustment at the four corners of the delivery table so that it can be easily and quickly adjusted to various depths of flasks, making each machine adaptable to a wide scope of work.

After the mold has been rammed, rocked over, the clamping device released and the machine vibrated, the workman, either with his hand or foot, pulls forward the side lever and operates cams which lower two plungers and allow the mold to drop away from the pattern. The pattern plate is fastened to the pattern frame, which is attached to adjusting guides fastened to a shaft operating in cast iron uprights. Spiral springs assist in rolling back the pattern plates. The cams are attached to the shaft to which the lever is keyed. The plungers are 3 in. in diameter and have a drop of 2 in. This with the rock-over movement permits the handling of patterns 6 in. deep.

Four depressible pins working at the four corners of the delivery table adjust themselves automatically to any unevenness in the bottom board. They work independently of each other and level the flask in all directions. The pins or posts rest on spiral springs and are depressed when the mold on the bottom board is rocked over. They are clamped in position, holding the flask true to the pattern until lifted from the floor.



Osborn Rock-over Drop-draft Molding Machine.

The machines are made in three sizes, for flasks, 18x30 in., 30 x 36 in. and 40 x 50 in., by the Osborn Mfg. Co., Cleveland.

LARGE CASTINGS.

Two large pump cylinders for the Toronto water department were cast recently in the foundry of Bertram & Sons, Dundas. These weigh respectively 22,810 and 19,320 lbs. The pumps are now being erected at the works of the John Inglis Co., Toronto.

Some Examples of Modern Molding Machine Practice

Three Classes of Molding, Bench, Side Floor and Heavy Work — Molding Pulleys, Directions for Molding Other Castings — Care Necessary in Making Cores.

By JOHN EDGAR.

The molding machine is in that stage of its development where it is being looked upon as a possibility in the average foundry. That it is meeting with that opposition which is the portion of all new methods that are of a labor saving character is an indication that it is soon to be as common in the foundry as the lathe and planer is in the shop. The molder of to-day should welcome a device which will help raise the craft up to a level with other branches of manufacturing trades. The molding machine is here and here to stay.

It has been employed in the production of small molds for such work as valves

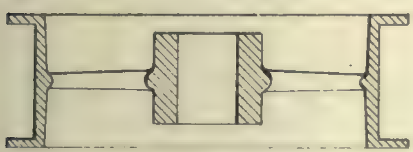


Fig. 1.—Section Through Flanged Pulley.

and pipe fittings and small machine parts. The nature of the machine used in such cases and the methods employed made it of little value in the ordinary foundry, being limited to such as work a pattern for thousands of castings in each lot, so that frequent changing of pattern and rigging of the machine was unnecessary. In the average case such as one meets in the small foundry connected with the machine-tool establishment or in the medium size jobbing foundry the frequent changing of patterns is a feature that must be accommodated.

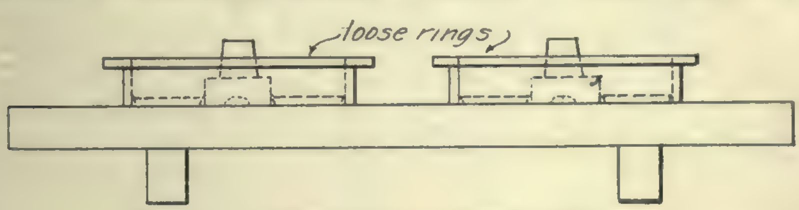


Fig. 2.—Pattern Board for Flanged Pulley.

As an example of what can be done and the conditions one meets in the ordinary foundry, a recital of what was found and the deductions made in a case where it was decided to employ, if possible, the molding machine on the run of work in a machine-tool foundry, will be worth investigating.

This foundry employed from 60 to 90 molders and core-makers, besides helpers and produced about 15 tons a day of machine-tool castings. One condition that forced the consideration of the machine proposition was the lack of production from the smallness of the equipment. The possibility of trouble with the union was also a matter that caused the management to look into the proposition.

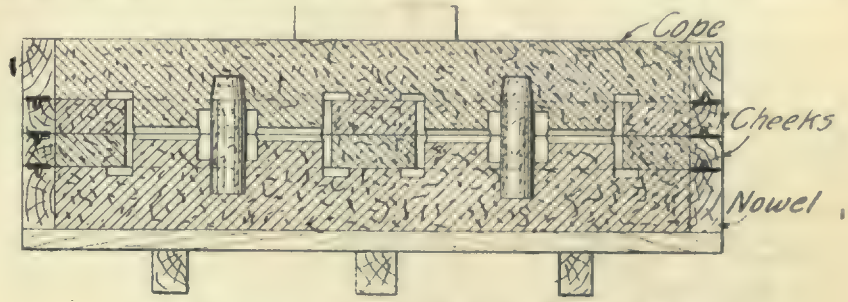


Fig. 3.—Section Through Mold for Flanged Pulley.

Three Classes of Work.

The work was found to be naturally divided into three classes: bench, side floor and heavy work. Bench work was mostly all handled in snap flasks and about ten men did the work with a continual call from the stock-room for this class of castings. Side floor production was still further behind the demand and about twenty men were employed on this work. The heavy work consisting of machine frames was also badly pushed by the call for castings from the shop.

The bench work was easily handled by three power-squeezers of the split pattern type, using snap-flasks, one man to a machine. The machines were manned by unskilled help and production was up to normal after the new men had been carefully instructed. These machines are practically automatic in the molding operation, requiring attention merely to feed sand and remove the finished molds.

The side floor work was next attended to and some little apprehension was felt in connection with this department. But after summing up conditions it was decided to try a machine of the roll-over type. The sand in this type was rammed by hand similar to the hand method.

These machines consist of a main frame which is carried on truck wheels making the machine portable. The frame carries a swing-frame, which may be swung or rolled over in a vertical plane through 180 degrees. This roll-over frame is given a vertical movement by actuating a lever either by hand on the smaller machines or by air or water pressure on the larger machines. These two motions are obtained in a manner peculiar to the make of the machine, there being several machines on the market which operate on this general principle.

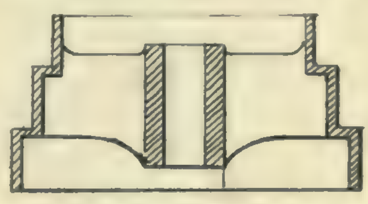


Fig. 4.—Small Cone Pulley.

The great advantage of this particular type of machine over others is that they are more flexible than the other types and are therefore more suitable for the general run of work, met with in the medium weight casting.

The side floor work is of a class where the depth of mold varies somewhat, requiring very deep copes and some with three or more partings. In many cases the cope had to be barred, a condition

that cannot be entertained in the power running machines.

Molding Pulleys.

A large amount of the work on the side floor was that of molding pulleys and as this work is of general interest

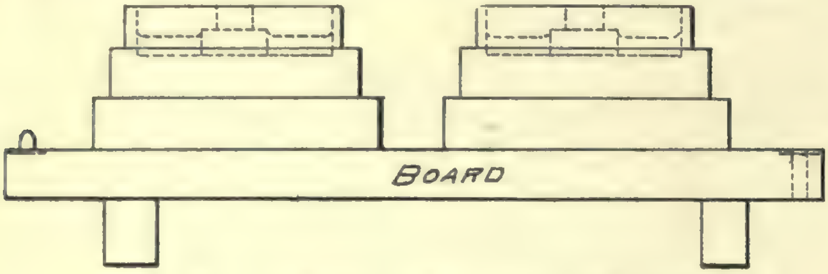


Fig. 5.—Board for Cope of Cone Pulley Mold.

three examples have been selected as illustrations. Fig. 1 shows a flanged pulley 12" dia. by 4" face. Two of these pulleys were cast in each mold. The pattern in the roll-over type of machine is fastened to a board the surface of the board making the parting of the mold, as this pulley is symmetrical on each side of the center, it was necessary to make only one pattern board. This board is shown in Fig. 2.

On account of the flange it was necessary to make the mold in four parts with three partings as shown in Fig. 3. The cheek was rammed up first and the cope or nowel next, as the case happened to be. A cheek and cope or a cheek and nowel were rammed up together before the pattern was drawn. The process is as follows: The machine with the pattern-board attached to the swing frame is levelled up and the frame set with the pattern facing upward. The check flask is placed on the pattern-board being positioned by dowels. The sand is rammed up around the outside of the pulley pattern, up to the underside of the flange and then levelled off flush with the edges of the flask, and sprinkled with parting sand. The cope or nowel flask, as the case may be, is then placed upon the check, being also positioned by dowels and the sand is rammed into the inside of the pulley and up to the top of the flask. After

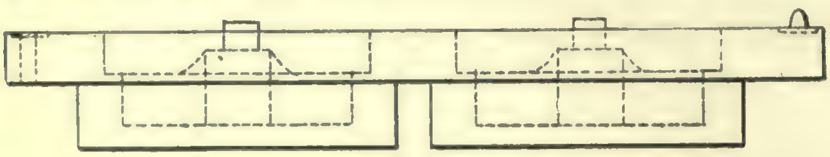


Fig. 6.—Board for Nowel of Cone Pulle y Mold.

striking off the sand a bottom board is clamped to the flask and pattern board, by means of wedge clamps and the flask and board are then rolled over 180 degrees bringing them other side up. The clamps are then removed and the frame is moved vertically upward drawing the pattern from the sand.

The board is vibrated before and during the drawing by striking it a few sharp blows with a hammer or mall. This vibrating can be accomplished by means of air-vibrators attached to the frame when compressed air is available. It is, of course, obvious that the flange is loose on the pattern and is left in the mold when the pattern is drawn being picked out after the cheek has been removed. This example illustrates the facility with which the split pattern may be used; any split pattern in good condition can be used on the molding machine. In fact the pattern for the above case was one that had been used as a hand pattern, and was one from which very few castings were taken at any one time. When as is often the case in pulleys and gears, the pattern is symmetrical except for the fact that the hub may be longer on one side than on the other or even of different diameter, one board may be used by making the hub loose and changing the hub as desired.

The cone pulley in Fig. 4 shows a job which is not symmetrical and which requires a change in patterns to make it of use on the machine. Fig. 5 and Fig. 6 show the boards. The board in Fig. 5 forms the outside and a portion of the inside while that in Fig. 6 forms the remainer of the inside. The mold is set up as illustrated in Fig. 7 which is a section.

Fig. 8 shows another cone pulley of similiar style, but of larger dimensions and more steps, making the mold much deeper. This was attempted entirely in green sand much on the plan given above but while it would be done it was very difficult, and as the sand could not be made always of just the proper temper, the core caused trouble. Figs. 9 and 10 show how this was eventually handled the green sand portion, shown in section, Fig. 10, being made to consist of the nowel and the dry sand core being hung on the print as shown.

This method of handling this job has long been used in hand-molding and has proved a success over all other methods of setting the core. It requires no cope

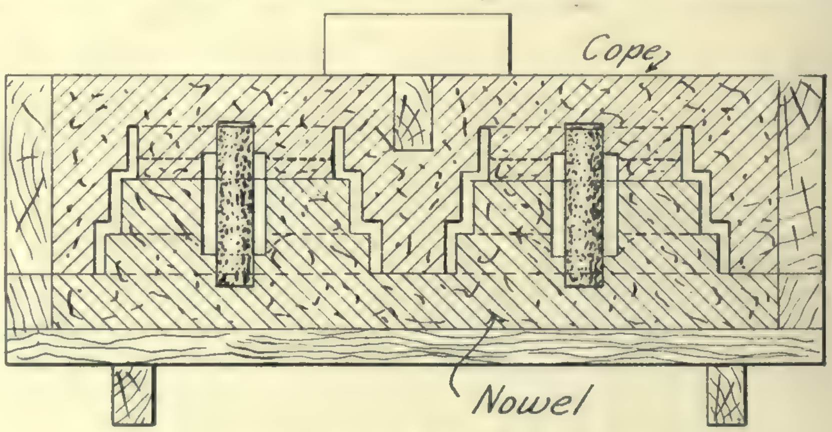


Fig. 7.—Section Through Mold of Small Cone Pulley.

or at most a blind cope. The cores are weighted so that there is no danger of them floating.

In each of the examples given two castings are made in each mold. The flask was about 24" x 36" which size was found very convenient for general work. The fact that the handling of the pattern and flask in the drawing operation is mechanical, the large flask was possible.

Other examples may be mentioned but not being of such general interest they are not illustrated. They are tables, carriages, knees, gear-boxes for milling machines, and even the frames of the smaller sizes were handled on the machine. One frame weighing about 900 lbs. was handled successfully, a couple of unskilled men turning out a mold in about four hours that originally took a skilled man and helper, a whole day to do by the old method. Much better

time could have been made had the molding been done by the skilled man.

After a good deal of experimenting the process was shifted down to a systematic order, the mold being rammed and the pattern drawn by an "unskilled" man trained into handling the ramming tools and the core setting being done by a skilled man, who also supervised in a general way the work of molding. He had a couple of crews at the machines under his supervision.

In such work of irregular shape as the carriages, knees and gear boxes that one finds on the modern milling machine, much core work has to be done. Loose pieces are substituted by a core, one core in many cases eliminating several loose pieces. Where the loose piece is large and such as not to be easily lost and one that can be easily picked from the mold, the core was not used, it being deemed simpler to retain the loose piece. This applies especially to the large work where but few molds were made at one setting.

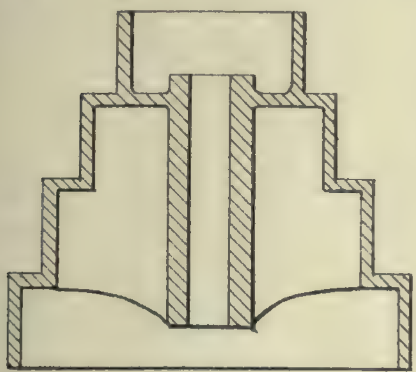


Fig. 8.—Large Cone Pulley.

Changing Patterns.

The ease with which the change can be made from one pattern to another on the machine is illustrated by the following. There was one machine of large size on which a number of patterns had been fitted and as the work was in constant demand, several of the patterns had to be worked at, at the same time. Thus, a frame, a knee and a large table were cast one day, only one mold of each being set up each day, meaning three changes a day.

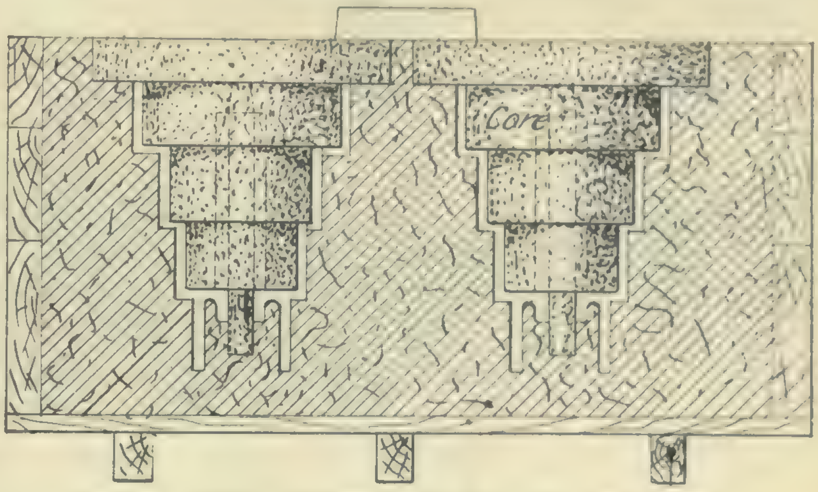


Fig. 10.—Section Through Mold for Large Cone Pulley.

In summing up it was found that the greatest advantages of the molding machine over the hand-molding method are: the established parting which is obtained by the fastening of the pattern to the boards, making it possible to ram the sand around the pattern without any bedding; the straight line drawing action of the machine which does not require the skill that is required in drawing the pattern in hand-molding. The drawing action of the machine and the security with which this drawing motion is held from other than vertical direction makes it possible to draw the pattern from the sand without tearing the mold and also in the actual time saved in the operation. The guided drawing action makes it possible to vibrate the pattern sufficiently so that the sand is shaken free from the pattern without rapping the mold out of shape as is the case in hand molding where rapping of small patterns in the sand causes the enlargement of the mold of an amount equal to and in many cases more than the shrinkage. If this rapping were always uniform it might not be so bad as allowance could then be made. Patterns have been placed on the machines that when cast show the effect of the excessive rapping that they received in hand-molding, by not having sufficient metal to finish up, the pattern having been turned down in order to reduce the turning allowance in the old hand-molded castings.

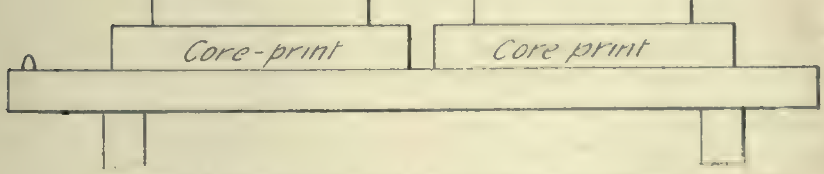


Fig. 9.—Pattern Board for Large Cone Pulley.

In the case of the molding machine the pattern must have good draft as the straight line action in drawing the pattern does not allow of the lateral movement that is possible in hand-drawing. There is little doubt that more draft is desirable even in cases molded by hand. Torn molds are the chief cause of lost time in molding either hand or machine. The draft is imperative in the case of machine moldings. The patterns should be given all the draft that they can stand, patternmakers seem to think that if the pattern shows draft when tested with a square it is sufficient, but it should never be less than $\frac{1}{8}$ of inch per foot.

Cores and Core Prints.

Draft in the case of core-prints should be even more rank than in the case of the pattern and should be more on the lines of a bevel. The setting of the cores is a difficult job even when everything fits perfectly which is hardly ever the case. Lots of trouble is caused by ill-fitting cores. Much of this trouble is caused by not having the prints beveled. If a core does not drop into place the core setter will most surely use a file on it and filing of cores is a thing not to be encouraged. When the number of cores are increased to the extent that is necessary in machine-molding, every minute saved on each core amounts to a great deal in the aggregate.

Standard Fitting and Valve Company's Plant at Guelph.

The Works of The Standard Fitting and Value Co., Guelph

The Layout of the Buildings, with a Description of the Foundry Equipment, Molding Machines and Foundry Transmission Arrangements.

A Canadian industry, which has been making most satisfactory progress since it began operation on October 9th, 1907, is the Standard Fitting and Valve Company, of Guelph, Ontario. The works are now run at their full capacity, 125 men being employed, the larger number of whom, if not all, are doing skilled or trained labor.

During the past year, owing to the temporary depression which more or less affected all manufacturing concerns, there was a slackening up to some extent in the lines in which the company is engaged, but the outlook for the future is most promising and many orders from all parts of Canada are being filled.

At present only cast iron fittings are made but in the near future valves will be manufactured and placed on the market. A large proportion of the fittings turned out are used in Guelph, particularly by the Taylor-Forbes Company and the Page-Hersey Iron, Tool and Lead Works. The company began building operations in May 1907, being organized a month previously. The plant of what was the Aird-Platte Manufacturing Company (now the Aird Manufacturing Company), of Watervlett, which is situated across the river from Troy, N. Y., was taken over and, along with a large consignment of new machinery, was placed in the specially fitted up and admirably laid out buildings in Guelph. George W. Aird is the managing director and secretary-treasurer of the company, his father, Henry Aird, being president, and John M. Taylor, vice-president. Practically all the capital stock is Canadian, the bulk of it being held by residents of Guelph. At the time the company was thinking of locating in Canada offers from other places were made but the promoters decided upon Guelph for several reasons, one of the strongest being that its cast iron, steam water and gas fittings were largely required by Guelph industries for radiators and other products. All fittings are made from one eighth of an inch to ten inches inclusive, lock nuts, elbows, tees, crosses and Y's, caps and lock nuts, flange and flange unions, bushings and plugs and expansion plates, as well as flanged fittings from 2½ inches to 16 inches inclusive, both standard and extra heavy.

Detail and system are observed to a marked degree in the design and plan of the buildings of which W. A. Vahoney was architect and George W. Aird the designer. The foundry is 160 x 80 feet, the tapping room 80 x 70, the shipping room 120x40, the metal and wood pattern and tool room 120 x 30, the core room 40 x 20, two storey, and the office 30 x 20. All the departments are separated by walls of solid brick and fire proof doors. The buildings while somewhat irregular in shape are modern and but one purpose was in view--that of affording the greatest facility and economy in the arrangement and working plans. The pattern shop and tool room are immediately back of the office and shipping room. The remainder of the main building, to the width of thirty feet, is given up to the machine shop with the exception of the space devoted to the tapping room, behind which are the engine room and boiler house. The cleaning room is located between the tapping room and the foundry. In a separate wing of the structure are the core room, core ovens, stock storage and cupola.

Foundry Practice.

Moulding in the foundry is entirely done by machinery. Two Berkshire molding machines, with a capacity each of 120 molds an hour are employed. The working of these machines is of interest.

The flask and bottom board having been put into position and the lever thrown, the sand is sifted in the riddle at the rear of the machine, and then conveyed in a bucket-elevator to the hopper above the machine. The flask is next automatically carried to the rear, where it is filled with sand. It then travels forward and is met in its course by the bottom board supported upon the ram, which is forced down, thereby ramming the sand. At the instant of ramming, the vibrator is automatically thrown into action, which makes impossible the formation of any vacuum, and also prevents the sand from adhering to the pattern. The lifting pins then raise the flask off the pattern. While the flask returns to receive its supply of sand, the bottom board is supported by suitable hooks, but as the ram comes down, these hooks are drawn back so that the board remains upon the mold. All the operator has to do is to lift off the

flask and set it to one side, blow the sand from the table with the air hose, and all is ready for placing the other half of the mold. The attendant may economize time at this point by placing the second half of the flask upon the machine, and throwing the starting lever before removing the half mold already completed from the bench. By the time he has removed the finished half-mold to the floor, the second half mold will also be completed, and will be ready to be lifted off. When using snap flasks and making light molds, the mold may be assembled at the side of the machine, thereby making necessary but one trip to the floor. In such case, the molder can have two sets of flasks, and arrange it so that the machine will be ramming the drag for the second mold while he is carrying the first to the floor.

The pressure of the ram upon the sand can be quickly adjusted, and as the flasks are filled automatically, every flask will be rammed alike. It is also possible to adjust the boards in such a way that the drag will be rammed harder than the cope. When making the cope, the machine is so arranged that it cuts the sprue. The pattern plates are placed in an ordinary table, or platen, at the front of the machine, and can be changed easily and quickly by removing four screws which hold the plate in position, and slipping in the new plate. One of the features is the heating of the pattern plates by gas jets from beneath, so that the molds draw readily, without the use of any parting material whatever. By this method, with the proper grade of molding sands, very fine work is made possible without any facing. Moreover, since no parting sand is introduced, the life of the molding sand is greatly increased.

Eight hand squeezing machines each with a capacity of 150 moulds a day and two stripping plate machines each with a capacity of 150 moulds a day built by the company are also part of the equipment.

Conveying Apparatus.

The main feature and most noticeable in the foundry organization is the automatic apparatus for conveying the moulds from the two Berkshire machines to the casting floor and when the castings are made to return the sand and metal, the former to a special mixing hopper and the latter to the cleaning room. The man working at the Berkshire machine can place the mold on the table of this automatic carrier, which runs the length of the foundry and which allows the mold to be taken off at whatever part of the floor they are required, as the conveyer is reversible. This allows the molds on being poured to be placed thereon and taken back over the hopper where the casting is knocked out and falls off into a car running on a trolley underneath and delivered to the cleaning department. The sand falls through the rack into the hopper where augers feed it to an elevator by means of which it is carried to the sand mixer. This sand mixer thoroughly mixes the sand and delivers it back to the floor near the moulding machines.

The lower portion of the cupola is composed of two sheet steel shells, the inner shell being made very heavy and of the same size as the stack proper, the outer shell and encircles the inner one and is made air tight, forming the air chamber. In the outer shell are arranged two doors for shutters held in position by tap bolts, also made air tight, which may be removed and again replaced to allow for cleaning should any coke or slag accumulate in the air chamber, the air chamber is not fastened to the bottom plate, but is separate and distinct. Opposite each tuyere also is a sliding air tight gate with peep-hole. The tuyeres are so arranged that the blast is distributed over the entire area of the combustion chamber and are constructed in such form that the melted iron in its downward course cannot pass through them into the air chamber. The capacity of this cupola is about 15 tons an hour and a cast is made every day.

Foundry, Showing Molding Machine and Conveyor.

The raw material is delivered from the Canadian Pacific Railway siding to the door of the cupola room where it is transferred to an electrically operated elevator which lifts it to the charging floor.

Core Room.

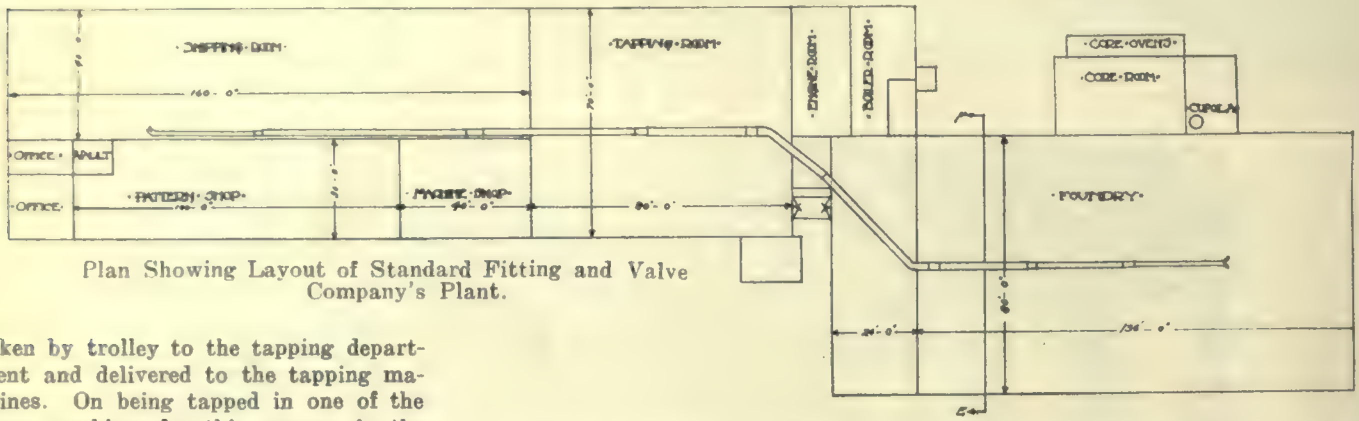
The cores are made on the second floor of the core room, which is really

a separate building adjacent to the foundry. When made the cores are let down on a dummy elevator to the first floor, where they are baked and stored.

The castings, which are transported from the foundry by means of a trolley car, on being delivered from the automatic carrier are taken to the cleaning room adjacent. They are here cleaned in tumbling mills, which have a dust arrester attachment, which keeps the cleaning room free from dust and dirt.

Tapping Room.

After cleaning, the castings are given any necessary grinding, whence they are



Plan Showing Layout of Standard Fitting and Valve Company's Plant.

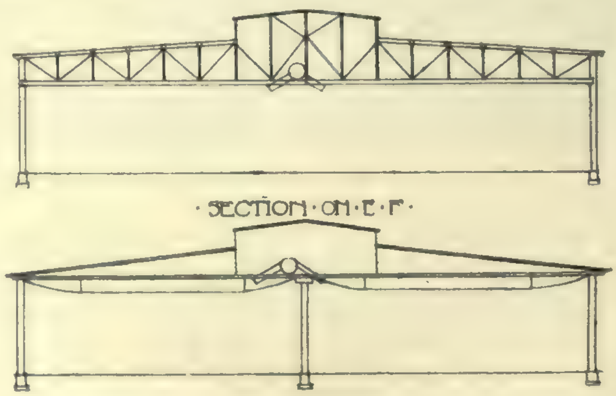
taken by trolley to the tapping department and delivered to the tapping machines. On being tapped in one of the many machines for this purpose in the tapping room they are conveyed in a special metal tank to the cleaning tub. This tub is set in the floor, situated immediately over which is an air hoist. The tank mentioned, which is conveyed on a trolley, passes the various machines and collects the fittings from them in a perforated iron bucket. On being brought to the tub the air hoist lowers it into the cleaning bath where the now finished product is thoroughly cleaned. By trolley it is again taken to the stock and shipping room where the fittings are sorted and placed in their respective compartments.

One of the largest machines in the tapping room is for tapping threads four to eight inches. A notable machine is one known as the Walters three-way machine, which is the only one of its kind in existence, being built especially for the Standard Fitting & Valve Co. The taps, tees two inches and under all three ways at once. It is provided with a double chuck so that the operator may be taking out a tap tee and placing in a new one while the other is being tapped. It is entirely automatic, the lines of the fittings tapped by this machine are absolutely true when done in this machine, as the taps themselves are so adjusted as to render non-alignment impossible. The machine reverses itself and taps are withdrawn automatically, one starting after the other so that the strain on reverse does not come on one machine all at once.

Acme bolt cutting machines are used for cutting plugs and bushing. Flange unions are faced on a lathe and screwed on arbors so that the facing is absolutely true with the thread cut. The tapping of bushings is done on a four spindle tapping machine that works automatically.

The machine shop equipment includes planers, shapers, milling machines, lathes and drill press and also pattern making equipment for both wood and metal patterns.

The stock room, which is a large airy department has the entire walls lined with bins to the ceiling. Each bin is 3 feet deep and 2 feet square. There are 1,000 of these bins in all. Half way to the ceiling all the way around is a platform to enable a man to reach the upper tier of bins. A Fairbanks standard scale is situated in the centre of this room. Running the entire length of the stock room is a platform from which cars may be directly loaded as



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Sectional View of Plant.

the arrangement is such that the company's siding parallels the stock room.

Power House.

The power house is equipped with a Goldie-Corliss engine of 150 h.p. of similar design to that installed in the power plant of MacGregor-Gourlay Co., Galt. The fly-wheel is 14 inches in diameter with a 20 inch belt. The boiler is of 150 h.p. at 120 pounds pressure. The lighting equipment consists of a 50 h.p. generator. It supplies power for the motors, for the blower and elevator and the electric lighting of the entire plant, which consists of Nernst lamps. The ventilating and heating system is by the Dominion Heating & Ventilating, Hespeler, and includes a system of heating the entire building, except the office, by forced draught. The fan is driven by a steam engine, 12 h.p., 250 r.p.m. An air compressor is also installed for supplying power to the various compartments where compressed air is used.

Deeds are mightier than words and actions louder than boasting.

Capital has been raised and a company formed to build a railroad from Victoria to Barclay Sound. The company is trying to secure certain concessions from the Government. The road will be over 100 miles long and will open up a vast timber country. It is planned to begin immediate construction as soon as concessions are obtained.

The elevator to success is generally stuck: try the stairs.

INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News.

Foundry and Machine Shops.

Murray & Davidson, machinists, Elm Creek, Man., have dissolved.

E. R. Hardendorf's machine shop at Brockville was burned recently.

The Huntsville Engine Works Co., Huntsville, Ont., have obtained a charter.

Emond, Vezina & Chartier's foundry at St. John, N.B., was damaged by fire recently.

M. McGuire, Dresden, Ont., has sold his machinery and carriage business to Jas. McGregor.

H. Williams' machine shop at Port Arthur was damaged to the extent of $2,000 by fire on Feb. 9.

The Canadian Foundry Company, Fort William, will make a $17,000 addition to their plant in the near future.

George White & Sons, London, makers of engines, etc., report that their staff of 160 men are working 60 hours a week.

R. Armstrong and J. Armstrong, two well-known mechanics of Revelstoke, B.C., will leave shortly for Vancouver to open a machine and repair shop.

Tallman Brass and Metal Co., Hamilton, manufacturers of brass castings, babbitt metal and solder contemplate erecting a new foundry in the spring.

Seaton Bros., New Westminster, B.C., have purchased the Crane shipbuilding yards and will immediately carry out improvements by opening a machine shop and wood-working plant.

A factory for the manufacture of Stirling Boiler Injectors for marine, locomotive and stationary boiler purposes, the invention of W. H. Stirling, St. John, may be started at that place.

The London Rolling Mills report business is a great deal better than it was last year. They are working full time, ten hours a day, for six days a week, and have 125 men. Business has been steadily improving since May last.

The G. Walter Greene Company, Peterborough, which will manufacture all kinds of sawmill machinery, has elected officers as follows:—President, G. Walter Green; vice-president, S. Greene; secretary-treasurer, T. O. Donaldson.

The Hamilton Steel and Iron Co. has secured a large order of steel for one of the Hill railways in the Northwest. The order comprises 300 tons of angle iron for connecting rails, and 160 tons of railway spikes. There will be 20 carloads of steel in the order.

A tin smelter in the immediate neighborhood of Victoria will be the next development work on Vancouver Island. This will be built by the Pacific Tin Mining & Smelting Co. a concern which was incorporated on Jan. 14 of this year, and means to commence work at once.

The Silliker Car Works, Halifax, held their second general meeting recently, and the statement showed net earnings of $13,500. This was considered quite satisfactory in view of the general depression, and of the fact that the works have only been recently started.

W. J. Ellis, late of Rogers & Ellis, Vernon, B.C., has arranged to start a machine shop in Kamloops. His outfit will cost about $2,000. He will carry a stock of engineer's supplies, and will handle bicycles and bicycle repairing. Mr. Ellis has had 23 year's experience in some of the largest shops in the United States and Canada.

It is the intention of the Canadian Locomotive Co., Kingston, to further increase their capacity this summer, by building an up-to-date erecting shop. The only available space now left for the company is at the northerly side of the boiler shop, and extending over and covering the extension of Earl street. The company have asked the city for a lease of the land.

St. John & Crooker, St. Catherines, have leased the building on Bradford St., Barrie, formerly used as a ladder factory, and fitted it up with modern machinery including lathes, planer, drills, etc. A foundry has been equipped with a cupola. It is the intention of the company to build saw mill machinery. Mr. St. John was formerly with St. John & Black, St. Catharines. Mr. Crooker has been in the employ of McKinnon Dash and Metal Works.

At the annual meeting of the shareholders of the Williams Mfg. Co., Montreal, Bartlett McLennan presiding, the directors' report and annual statements were satisfactory. The old board of directors was re-elected, Bartlett McLennan, Francis McLennan, Wm. Yuile, James Rodger, C. W. Davis, C. E. Tutton and Alex. Langlois. At a subsequent meeting of the new board of directors, C. W. Davis was elected president, and Bartlett McLennan, vice-president.

The John Inglis Co., Toronto, intend erecting a foundry for large work and are now negotiating for land in the vicinity of their present works. It will be about 100x200 ft., well lighted. The usual equipment will be installed. The shops are very busy at the present time. Work is going through for the Toronto water works, Edmonton water works and for the Toronto Gas and Electric Co. Their foundry work is being done at the Berg Machinery Mfg. Co. and other foundries until their own is erected which they expect will be during the coming summer.

The receiving of a portion of the construction work for the Hydro-Electric Power Commission by the Canadian Westinghouse Company will mean a big thing for Hamilton. The plant has been running on short time for a considerable period and as it employs a large number of hands the receiving of such a big order will mean the employment of full staffs and the consequent circulation of more money among the merchants. It is understood that the work has not yet been apportioned by the Government between the Canadian General Electric Co. of Peterboro, and the Westinghouse Co.

Bean Bros. have completed their new machine shop at Fernie, B.C., the whole plant being designed with a view to enlarging in the future the power plant and furnaces being double the present requirements. The main building is 40 x30 feet, two storeys high, and the moulding room 30x60 feet, all of concrete. The machine shop occupies the lower floor of the main building and is supplied with a 36-inch planer and 9-foot bed, a 42-inch lathe with 16 foot bed; a 24-inch lathe with a 14-foot bed, and a 12-foot lathe with 19-foot bed, besides a drill press. Motive power and heat are supplied by steam.

Municipal Undertakings.

Brantford will extend its sewerage system.

Sarnia is considering instaling a civic steam heating plant.

Victoria has secured $1,200,000 with which to instal a new water system.

Winnipeg will start work at once upon the construction of a $65,000 sewer.

Toronto City Engineer has recommended a number of extensions of water mains.

Point Grey, a suburb of Vancouver, proposes to introduce a water and sewerage system.

Etobicoke Township, Ontario, asks power to start a sewage disposal plant at New Toronto.

The Hull waterworks are to be extended. New hydraulic pumps will be installed and a new main laid.

City Engineer Ruttan of Winnipeg, recommends a new softening plant for the waterworks at a cost of $150,000.

The by-law to establish a waterworks system in Aylmer resulted in the ratepayers deciding to undertake the improvement.

Plans will be prepared by City Engineer Ruttan for the construction at Winnipeg of a trunk sewer for the district west of the Red river.

Price Ellison has offered to put in a water system at Vernon, B.C., for $35,000, which will give unlimited water and reduce electric light rates.

Work is to be commenced at once on a system of waterworks at Clinton, Ont. An engineer will shortly be appointed and contracts awarded.

Construction work on the central section of Revelstoke's, B.C., sewerage system will be done by T. F. Sinclair. Work will commence on April 1.

Among Toronto's estimates for 1909 is $153,000 for water mains to supply East Toronto and the high level east of the Don, and $60,000 for detection of water waste.

The G.T.P. are installing a new water system in Prince Rupert, the old plant having been found inadequate. A reservoir of 50,000 gallons capacity will be erected.

Tenders will probably be received about April 1 for the proposed septic tanks for city sewage at St. Thomas, for which the citizens on Jan 4 voted to issue $40,000 bonds.

Mr. Fellowes, Toronto's waterworks engineer, states that in order to provide proper water supply for East Toronto it will be necessary to extend the city's high level system.

Vancouver's waterworks construction work for 1909 includes the building of the Little Mountain reservoir and its connection with the city system by the construction of five miles of mains.

City Engineer Rust, of Toronto, has recommended that J. D. Watson, Birmingham, England, and Rudolph Hering, New York, be engaged to make a report on the whole problem of sewage disposal for Toronto.

The Harbor Commissioners are considering extensive improvements to the port of Quebec. Among the projects contemplated are the installation of steam cranes on the embankment, the paving of the cross wall, the supply of water to all the wharves and an increase of the storage resources.

The purchase of several electrical pumps is recommended by Toronto's city engineer for the waterworks system. He wants two ten-million gallon electrical pumps for the high level, $60,000; two five-million gallon high pressure pumps, main pumping station, $50,000, four thirteen and a half million gallon electrical pumps, main pumping station, $150,000.

It is stated that the dredging of the Carp river will be commenced at the earliest possible date this season. The scheme is the largest drainage project ever undertaken by the county and will begin a short distance from Hazeldean, Ont., and extend nearly twelve miles to about a mile and a half west of the village of Carp. The estimated cost is $25,000.

One of the schemes that the Toronto Board of Control will consider the early part of this year is the construction of a system of overflow sewers for the city, and City Engineer Rust has been instructed by the controllers to prepare a report. It is estimated that the cost of the work will be in the neighborhood of three-quarters of a million dollars.

Willis Chipman, C.E., Toronto, has reported to the Weston Town Council in reference to the establishment of a system of waterworks. Mr. Chipman recommends an expenditure of $[illegible] on the installation of a system, the source of supply to be the Humber River, the water of which is to be pumped into sedimentation basins thence through mechanical filters and on to a supply tank to be erected at the north end of the village, with a capacity of 100,000 gallons.

The town council of Notre Dame de Grace decided to purchase the property of the company which supplies water to the municipality. Henry Miles is the seller of this property, and the price named is $292,000. The supply of water is taken from Lake St. Louis, and the power house is situated at Lachine, south of the canal. The pumps furnish 1,500 gallons per minute and supply not only the municipality of Notre Dame de Grace, but also Montreal West and St. Pierre.

The Peterboro Water Commissioners are seeking permission to go to the people with a by-law seeking authority to borrow $120,000 for the purpose of erecting a new dam, a new power-house and a new pumping plant. The whole equipment will be strictly modern in every detail, and will last for many years. The pumping capacity will be trebled. 1,200 electric horse-power will be developed, 500 horse-power will be used by the Commissioners, and 700 will be available for the city.

Railway Construction.

The Kootenay Central will build 200 miles of road the coming summer.

The Great Northern will spend $3,000,000 at Vancouver this year erecting terminals.

Work has begun on the construction of the E. & N. extension from Wellington to Alberni, B.C.

The G.T.P. is planning to build branch lines into East Kootenay and the Crow's Nest Pass country.

The B. C. Electric Co. is lowering the grade on its main line between Vancouver and New Westminster.

The Canadian Pacific Railway has ordered 20,000 tons of rails from the Algoma Steel Co. at Sault Ste. Marie.

The G.T.R. has recently placed an order with the Pressed Steel Car Company, of New York, for 1,000 steel hopper coal cars.

The Saskatchewan Central Railway is seeking a charter to build five branch lines in Saskatchewan, over 1,000 miles in length.

The Atlantic, Quebec and Western Ry. is proceeding with the construction of the line from Port Daniel to Gaspe, Que., 82 miles.

Both the G.T.R. and C.P.R. are preparing plans for the Toronto Viaduct in accordance with the order of the Railway Commission.

The Tillsonburg and Southern Counties Radial Electric Railway propose to build a line running from Tillsonburg to London, Woodstock and Ingersoll.

The extension of the Central Ontario Railway from Lake St. Peter to Whitney, a distance of about 20 miles, is under construction, and work will be proceeded with during the coming season.

The Morrisburg Electric Railway has plans under consideration for beginning construction on its projected line this spring. The road will be 70 miles in length and will extend from Morrisburg to Ottawa.

The Dominion Parliament will be asked next session for an act incorporating a company to construct a railway from Victoria, B.C., by way of Otter Point and San Juan to Barclay Sound, near Sarita River.

The Heaps Telephone Company, New Westminster, are planning to construct a railway, to be operated by either steam or electricity, for the logging of their timber limits, located along the west side of Stave River.

The Pacific Northern & Omineca Railway are applying to the B.C. legislature for amendments to their charter giving the company power to construct and operate a line of railway from the junction of the Bulkley and Telkway Rivers.

Applications will be made by the Kettle River Valley Railway Company for incorporation to operate a line of railway from Midway to Penticton, B.C., a distance of about 120 miles, and from Penticton to Nicola, a distance of about 150 miles.

An up-to-date street car service is proposed for Belleville by a prominent firm of New York capitalists who will establish a city and suburban line, extending from Belleville to Trenton, through Trenton to Prince Edward County, and from Belleville to Shannonville, Thurlow and Corbyville.

A company is seeking authority to construct a line in British Columbia from Lena Island along the valley of the Honna River to Camp Robertson and Camp Wilson, and from thence to a point on Shield's Island, Rennell Sound, etc., with power to construct branch lines not to exceed twelve miles in length.

James A. Ross, president of the Dunnville, Wellandport & Beamsville Electric Railway, states that plans have been made to begin construction this spring. The road will extend from Dunnville through Wellandport to Beamsville, a distance of 23 miles. A by-law has been recently passed by Dunnville granting a bonus of $15,000.

Application will be made to the Dominion Parliament to incorporate the Arnprior & Pontiac Railway, to construct a line of railway from the Pontiac Pacific Junction Railway to Fitzroy Harbor, Ont., and High Falls, on the Kingston & Pembroke Railway, also from Fitzroy Harbor to Britannia, on the C.P.R., and to South March, on the G.T.R.

Location surveys have been made for an extension of the Quebec, Montreal & Southern Railway from Ste. Philomene, Que., to Quebec bridge, 41 miles, but that contracts will not be let until the completion of the Quebec bridge is an assured fact. Surveys also have been made for extensions to Levis, an additional seven miles; and for a branch from Becancourt to St. Lawrence River, four miles.

D. D. Mann, vice-president of the C.N.R., stated that at an early date a line would be constructed from Edmonton northwest to Fort Assiniboine, on the Athabasca River, and eventually to Lesser Slave Lake and the Peace River Crossing. It is also understood that the C.N.R. will build a line from a point near the eastern boundary to Edmonton, north of the Saskatchewan River. Another line will probably run from Strathcona to Calgary. Other important extensions are contemplated.

The Farmers Ry. is seeking power to construct a line or lines of railway from Regina to Humboldt, and thence to Melfort, from Melfort northerly along the Carrot River to the eastern side of the Province; from near the Carrot River west to Prince Albert; from near Humboldt to Saskatoon, and from Saskatoon northwesterly to the west side of the Province; from or near the south end of Last Mountain Lake to Moose Jaw, and from Moose Jaw south to the international boundary, and to extend the line from Regina southeasterly to the international boundary.

General Manager McLeod, of Canadian Northern, states that the company will make large additions to the terminal facilities at Port Arthur. Some are definitely arranged and others are in contemplation. To increase the freight storage capacity at the docks a shed is now being built over the steel dock. A new dock is to be built just south of the present dock, and on it work will be started as soon as feasible. It will be used as a steel dock during the early summer and for freight when the fall rush commences. New tracks will be laid through the yards, including lines to the new elevator to be built by Piper & McWilliams.

Electrical Notes.

A $10,000 electric light plant is proposed for Listowel.

The Electric Light Company, Okotoks, Alta., are erecting a building and installing machinery at a cost of $10,000.

The Liverpool, N.S., Town Council are considering the addition of another generator to their lighting plant.

The Saraguay Electric & Water Company, Montreal, will construct about 2 miles of transmission lines this year.

The Kentville, N.S., Electric Light & Power Co. will in the near future, install another small generator in their lighting plant.

Tenders are now being asked for two new boilers and a 260 kw. direct-connected generator for the Macleod, Alta., municipal electric light plant.

The Montreal-Cobalt Power Co. expect to have 25,000 horse-power to supply users within a radius of 100 miles of Cobalt within nine months.

C. Deutcher, Vancouver, has been engaged by the management of the Tranquille sanatorium to report on the most efficient scheme for power supply at the institution.

H. K. Dutcher, of Cleveland and Dutcher, Vancouver, B.C., have been engaged by Kamloops, B.C., to make a report on a scheme for reorganizing the municipal electric lighting and pumping plant.

The committee of the Montreal City Council report in favor of seeking legislation that will empower them to buy out the Montreal Water & Power Company. The price asked by the company is about four and one-half millions.

Cecil B. Smith, one of the Hydro-Electric commissioners, has formed a company to supply electric energy to Cobalt, and the mining camps in that vicinity. He says he can reduce the cost from $150 to $50 by his scheme, which calls for an immediate expenditure of a million dollars.

The City Electrician of Victoria, in his annual report recommends the extension of the city's electric light plant by the addition of equipment having capacity for at least five hundred lights. He also recommends that a suitable building for store purposes be erected at the lighting station.

A telephone system will be built by the Hydro Electric Commission along the public highway, paralleling the course of the power transmission line and with points at every mile where connections may be made. This is to ensure facility for the linemen in communicating with the nearest sub-station in cases of accident.

An end has been brought to the long and involved dispute over the water powers of the Kaministiquia River. The Kaministiquia Power Company claimed all the rights on the river. Dog Lake is a natural reservoir toward its head, and Port Arthur and Fort William wanted authority to develop power from it for municipal purposes.

J. E. McFerran, of the Parker Electric Company, Nanaimo, has installed a 30-light dynamo for W. H. May, recently of Strathclair, Man., who has remodelled the residence on his farm at Cowichan. A Fairbanks-Morse gasoline engine was put in to supply the dynamo, and the combination has given one of the most satisfactory private lighting plants in the district.

By the introduction of new and thoroughly up-to-date cars, and an extensive addition to and re-arrangement of its car tracks, the B.C. Electric Railway Co. will soon start upon a work involving the expenditure of $100,000 in Victoria. Six new cars have been ordered. The motors will be the 440 horse-power type, and each car will be fitted with air brakes.

M. W. Beach, Iroquois, Ont., accompanied by Mr. Gilmour, electrical engineer, Toronto, are working on a plan to transmit power from Iroquois to Brockville. Mr. Beach wants to build a transmission line and to supply the water department with power. The line would pass through Prescott and Cardinal, and negotiations are being conducted with these places.

A deputation from Ottawa district waited upon the Hydro-Electric Commission to urge the erection of storage dams on the Mississippi river. It was pointed out that the generation of electrical energy by this means would be very cheap and beneficial to Carleton Place, Almonte, Blakeney, Pakenham, Appleby, and Galeta, as well as to private industries. Consideration was promised.

The C.P.R. is conducting experiments with a view to electrifying its western lines. It is proposed to commence on the mountain lines, utilizing the water-power that is running to waste on the eastern slope of the Rockies. But freezing causes a great diminution of this power in the winter, and the question is whether what is left would prove sufficient to operate the main line during the winter season.

The Seymour Power & Electric Company, Campbellford, is placing contracts for the construction of a power house there. When complete it will develop 4,000 horse-power, and contracts for the more important machinery have already been made with The Canadian Westinghouse Manufacturing Company, The Canadian General Electric Company, Wm. Kennedy & Sons, and The General Electric Company of Sweden.

A bill introduced by Hon. Adam Beck, chairman of the Hydro-Electric Commission, has been passed by the Ontario Government giving the Government authority to build a dam at Dog Lake to raise the level of the river, provide a large storage, increase the water power and give an equal flow during the year. It is understood that on the completion of the dam the powers it provides and creates will be administered by the Hydro-Electric Commission for the benefit of all concerned.

The Nepean Bay section of the new Ottawa aqueduct is practically completed. It is the intention of the power owners shortly to raise the level of the bay by a foot and a half by utilizing stop logs, and as this would flood out the coffer dams of the aqueduct, operations are being rushed. The cost of this section will be about $50,000. An expenditure to that amount has been authorized by the Railway and Municipal Board and application will be made for authority to finish it by constructing a canal down Ottawa street and on to the pump house.

The people of Middleton, in the Annapolis Valley, N.S., are considering the question of a lighting plant for the town. There is a small water fall of about twenty-five feet on the Annapolis river at Lawrencetown, about six miles below Middleton, from which they could develop about three hundred horse-power or more. They propose acquiring this, and building a power house, transmitting the power to Middleton. If Lawrencetown will fall in with the proposition, they can also secure their lighting from this source. At the present time, there are no electric lights in either place.

It is rumored that in the event of Hamilton entering into the Hydro-Electric project that city will be made the central distributing point for the power supply. The prospects for such a big undertaking are much brighter since the City Council revoked the contract made with the Cataract Power Company and decided to leave it to the ratepayers to say whether a new contract should be made with the above power company or with the Government power corporation. Should Hamilton be made the headquarters for the building of transmission lines and the distribution of power, it will be of vast importance to the city.

In view of the very large development of water power which will result from the completion of the Trent Valley Canal across the Province of Ontario, from the Georgian Bay to Lake Ontario, the Minister of Railways and Canals has thought it well that a policy should be laid down which will ensure the sale of this power to individual users at reasonable rates. Where power from the Trent Canal therefore is being sold to the public in electric energy or other form, power is being placed in the hands of the Board of Railway Commissioners to regulate the prices which the public will have to pay for it. This will apply to existing power works as well as to those which are established hereafter.

W. Kennedy, jr., Montreal, has submitted to the Peterboro Water Commissioners, plans for

the proposed new dam and power house. The plans call for a pumping plant of one new unit of three million Imperial gallons capacity per 24 hours when pumping against 115 pounds pressure in the air vessel, also the two 2½ million gallons each pumping units in the present pump house. The new unit will be first installed and set to work, after which the old units will be repaired, if necessary, and removed to the new pumping station, thus providing an uninterrupted water supply to the town. The pumping capacity will then be 7½ million gallons per day with provision in the pump house for an additional unit of 3 million Imperial gallons per day, thus ultimately providing for 10½ millions per day. The estimated cost of the dam, with bridge, power house, intake cribs, 7,500,000 gallons capacity pumping plant, installed complete, with suction and discharge pipes, is $117,000.

Structural Steel Notes.

The cemetery bridge at Stratford will be rebuilt.

It is proposed to widen Dundas street bridge, Toronto, at a cost of $47,000.

Tenders will shortly be called for a bridge at the foot of Bathurst street, Toronto.

The Algoma Bridge Co. is erecting a new bridge across Elbow river at Calgary.

The bridge recently destroyed by fire at St. Felicien, Que., will be rebuilt by the Government.

It is stated that work upon the proposed trans-Niagara bridge at Niagara Falls will be commenced early this spring.

A recommendation has been submitted to the Stratford city council in regard to the site of the proposed new Grand Trunk Railway bridge.

Projects at Oak Bay, B.C., include the erection of bridges across the Thames river, on Cadboro Bay road, and at Beach Drive, Shoal Bay.

It is understood that the C. P. R. will replace several of the wooden trestles between Vancouver and Shawinigan Lake by steel structures.

Plans are now being prepared by Waddell & Harrington, Vancouver's consulting engineers, for the new bridge to be erected on Cambie street.

At a recent meeting of the Portage la Prairie, Man., Board of Trade a resolution in favor of the construction of an overhead bridge was drawn up.

City Engineer Rust recommends the construction of a new bridge over the Don at Winchester street, Toronto. The new bridge will cost $15,000.

A joint railway and ordinary traffic bridge is proposed to be built across the Second Narrows at Vancouver. It is estimated the bridge would cost $600,000.

The new steel bridge to be erected at Van Vlack, in Simcoe County, will be 300 feet long and built on concrete piers and abutments. It will cost about $15,000.

The Railway Board have made an order that the T.H. & B. and the C.P.R. shall file plans immediately for the construction of a modern bridge over Garth street at Hamilton.

Thos. Murray, Quebec, has submitted to the Quebec Colonization Department a project for the construction of a bridge over the River Quinze in Temiskaming at an estimated cost of $30,000.

Tenders are being called by the British Columbia Provincial Government for the completion of a traffic bridge over the Columbia River at Revelstoke. Separate tenders are being called for the iron work.

The employees of the W. P. McNeill Company, New Glasgow, N.S., have placed in position the first steel for the new spans of the Fredericton-St. Mary's highway bridge. The span nearest the St. Mary's shore is being commenced first.

The contract for the construction of the 13-story Arcade building at Vancouver has been awarded to the Dominion Bridge Company, Montreal. Work is to commence April 1st, 1909, and the building is to be complete April 1st, 1910.

City Engineer Smith of Regina, is submitting to the Board of Railway Commissioners plans for the proposed Broad street and Albert street subways. The estimated cost of each subway is $85,000. They will have a span of 100 feet and a width of 94 feet, with provision for six railway tracks.

A project now under consideration at St. John, N.B., is the building of a bridge across the harbor at an estimated cost of three quarters of a million dollars. Plans are being prepared by F. W. Holt, and the Dominion and Provincial Governments are expected to co-operate with the city in the undertaking.

A new international bridge is proposed to be built at Niagara Falls a short distance below the Grand Trunk bridge now in use. The Canadian commissioners are William German, M.P., James Bampfield, John Bampfield and C. S. Warner, and the American commissioners, Harry Nichols, John L. Nice, M. J. Maloney and Lewis Hinkey.

The contract for the building of a dam, bridge and lock at Lindsay, upon which several Peterboro contractors tendered, has been let to J. Ritchie, a Western Ontario contractor. It is understood that the amount of the contract is between $40,000 and $50,000. Work will be commenced upon the contract as soon as the weather conditions will permit.

In connection with the appropriations for the Canadian Pacific Railroad work on the Pacific division during the coming summer, H. J. Cambie, consulting engineer of the company, states that one of the principal items in the estimates is for the construction of steel bridges along the main line and on some of the branches in the interior. The expenditure on this division on account of these bridge projects will be very large.

Planing Mill News.

The Lewis Miller Co. will probably build a large sawmill at Jordan Falls, N.S.

The Carnegie Mining Co. are erecting a saw mill at Port Perry, Ont.

T. R. Brigham, Vancouver, will erect a large saw mill at Port Essington, B.C.

The Dawson Lumber Company's mills at Yarmouth, N.S., are resuming operations.

A number of big lumber mills will be built on Fraser River, B.C., during the next three years.

W. E. Walsh recently leased the old cannery at the end of Third Avenue, Vancouver, and fitted the building up with the latest and most expensive machinery, as a sash and door factory. He reports that business in their line is decidedly good.

The Fernie, B.C., Lumber Company's new mill to replace the one destroyed in the recent conflagration, is now in operation, and is cutting and shipping lumber. The entire plant is not yet completed, but it will have a capacity of between 50,000 and 60,000 feet per day.

Building Operations.

Point Grey, B.C., will erect a municipal hall.

Ambrose Eisenhaur is building a carriage factory in Mahone Bay, N.S.

Shipyards costing $500,000 will be built this spring at Sault Ste. Marie.

The Rowden Manufacturing Co. will build a furniture factory in Guelph.

Beaverton and Thorah councils will erect a joint town hall to cost $12,000.

The new $200,000 Collegiate Institute proposed for Winnipeg will be built this year.

St. Matthew's Anglican congregation, Brandon will erect a new and larger church.

J. G. and E. Y. Lightheart, Vancouver, will spend $15,000 on a block of dwellings.

Two new wings to cost $70,000 will be added to the Home for Incurables at Toronto.

The Imperial Storage and Cartage Co. will build a $20,000 storage warehouse at Toronto.

The Hammond Potato Machinery Co. are rushing to completion their new factory in Galt.

A new transportation building to cost $86,000 will be built on the Exhibition grounds Toronto.

The Canadian Pacific Railway will rebuild their station at Bristol, N.B., at an estimated cost of about $3,000.

Tenders will be called immediately for the erection of the new Provincial Asylum for the Insane, to be erected at New Westminster.

R. R. Barbor, Toronto, has prepared plans for a two-story brick factory to be erected for M. P. Warren, at an estimated cost of $5,000.

Gregoire & Audet, Sherbrooke, Que., are preparing plans for the erection of a new parish church to cost $15,000, at North Hatley, Que.

The British Columbia Telephone Company have completed plans for a new office building at Grand Forks. Work will be commenced in the spring.

The G.T.P. will erect additional freight sheds at Melville, Sask., in the spring. Electrical generators to supply light and power will be installed.

The by-law asking that a bonus of $10,000 be granted the Wormwith Company to rebuild the piano factory, was carried by Kingston ratepayers by a majority of 641. Building operations will be commenced in the spring, and in the meantime another building is being used.

Extensive building operations in Hamilton are planned for the near future. The Meriden Britannia Company is calling for tenders for the erection of an addition to their building. The Imperial Bank is contemplating the erection of a large office building on which it is thought work will be started early in the spring. Another prospective building is a new Grand Trunk station.

General Manufacturing News.

J. C. Felger will erect a 35,000 bushel elevator at Calgary.

The Seeley Mfg. Company will erect a $15,000 factory at Windsor.

The Dominion Copper Co. propose to resume operations immediately.

The Empress Mfg. Co. will erect a $20,000 addition to its plant at Vancouver.

The Halifax Fish Company's factory at Dartmouth, N.S., was destroyed by fire.

Work has commenced on the construction of the new C.P.R. sheds at Vancouver.

It is definitely stated that the burned Globe Casket Works will be rebuilt at London.

The International Harvester Co. will erect a $10,000 four-storey warehouse at Calgary.

The Gould Broom Manufacturing plant at Kingston, Ont., was recently destroyed by fire.

The Sayward mills at Victoria, B.C., are running again with a complete outfit of new machinery.

The North American Bent Chair Co. are making extensive additions to their buildings at Owen Sound.

The McGillivray Creek Coal and Coke Co. will instal a $200,000 plant on its property at Coleman, Alta.

The box factory at Brantford, Ont., owned by W. J. Hampel was destroyed by fire recently at a loss of $16,000.

The Montreal biscuit factory owned by G. N. Pichet, was recently destroyed by fire at an estimated loss of $10,000.

The Grand Trunk Railway are stated to be preparing plans for the erection of several concrete elevators along their system.

The Alberta Clay Products Co. will erect a factory for the manufacture of sewer pipe at Medicine Hat almost immediately.

The Maritime Mfg. Co., whose premises were destroyed a year ago at Pugwash, N.S., will begin operations again at Halifax.

The Hobbs Manufacturing Company will shortly rebuild the glass works at London which were destroyed by fire some time ago.

It is reported that the T. & N. O. Railway Commission has decided to erect a car repair shop and a pipe-casting shed at North Bay.

The Erie Basket Co., of Leamington, has recently added to its plant by installing machinery for the manufacture of all classes of handles.

The last of the machinery for the Western Explosives, whose factory will be on Bowen Island, B.C., has arrived, and when placed in position manufacturing will begin.

E. J. Taylor, a member of West, Taylor, Bickle Co., Norwich, manufacturers of brooms, has withdrawn from the partnership and will manufacture these articles in Montreal.

The Vancouver Milling and Grain Co.'s elevator was recently destroyed by fire, the loss amounting to $100,000. It is stated that the company will rebuild as soon as possible.

The Mitchell Cooperage, of Chelsea Green, a suburb of London, the directors of which control a large basket factory in Ridgetown, intends establishing a basket industry on a large scale.

The McLeod Pulp & Paper Mills have statrted to manufacture boxboard at Milton, Ont., and intend to manufacture paper in the near future. The pulp mills of this company are turning out about 80 tons of pulp per day.

The Humane Horse Collar Co., of Omaha, Neb., is starting a Canadian branch in Hamilton. It has taken over the building formerly occupied by Gompf's Brewery Company.

The Victoriaville Furniture Co. have had to run overtime three days per week to keep up with orders. They have just added a two-storey wing, and are installing additional machinery.

The Dominion Telephone Mfg. Co., Waterford, has placed an order for 200,000 sand lime bricks with Schultz Bros., of this city. They intend erecting an addition to their present plant.

The Ottawa Paint Works have moved into their new building on Wellington St., and are installing the most modern paint machinery. The new premises are large, well planned and fireproof.

The Point Ann Quarries, is the name of a new company which is doing a large quarrying business at the Point, near Belleville, now famous for cement production. The head office and storage plant will be in Toronto.

Robert Richardi, of Arnprior, Ont., has been in Woodstock, N.B., looking into the matter of establishing a factory there for the manufacturing of clothespins. The idea is to purchase a mill now operated by James Carr and to instal new machinery.

Benjamin Broughton, John S. Broughton and Joseph Wheeler, formerly of the Hamilton Stamp & Stencil Company, are among the incorporators of the Superior Manufacturing Company, of Toronto, which will also manufacture stamps and stencils.

Additional machinery is being installed by the Kelowna Saw Mill Company so as to manufacture boxes for packing fruit in. This part of the plant will be ready for this season's trade. A new planer and conveyor are also being put in the sawmill.

Delahey Bros., Pembroke, Ont., proprietors of the National Manufacturing Company, which was recently burned out, have taken over the plant of the Cossitt Company, makers of agricultural implements, Brockville, and will make large extensions to the factory.

The McCaskey Register Company of Alliance, Ohio, has decided to locate its Canadian branch in Hamilton, and has secured the premises at the corner of Rebecca and Hughson streets. It will there manufacture for its Canadian trade account registers and other patented articles.

A report is current in Owen Sound that W. P. Telford, is endeavoring to interest a large American ship-building concern in a project for the erection of a modern dock there. The undertaking would include the erection of a large shipbuilding plant. The total cost has been estimated at $500,000.

The Imperial Steel & Wire Company, Collingwood, are preparing to take up the manufacture of screen doors and windows, green wire cloth, poultry netting and wire fencing. The necessary buildings and machinery will be made ready this year and manufacture commenced in time for next season's trade.

The Tudhope-McIntyre Company, a combination of the Tudhope Carriage Company, Orillia, and W. H. McIntyre, president of the W. H. Kiblinger Company, Auburn, Ind., who make a specialty of high-wheel motor carriages will manufacture this line of goods extensively in Orillia during the coming season.

The Western Elevator Co. represented by Mr. Read, late President of the Consolidated Elevator Company, has asked Fort William for exemption from taxation for a period of ten years on an elevator they intend to construct there early this year. The request was granted, and a by-law will be submitted to the ratepayers.

The Sanderson-Harold Co., of Paris, Ont., have a number of hands employed in the Plow Company works getting things in shape for the re-starting of the works. The office staff have taken up their quarters in the market building, which is also undergoing slight renovations to suit the needs of the various departments of the company.

Twenty carloads of machinery have been received for the new plant of the Nicholas Chemical Company, now under construction near Barnet, on Burrard Inlet, B.C. C. W. Nichols, president, before leaving for New York, stated that the plant will be in operation in two or three months. The raw material will be imported from Japan.

George White & Sons, London, have decided to extend their plant on Cabell Avenue. The firm has built a large factory on Cabell Avenue, south of the Grand Trunk, and the building is now used as the woodworking department. The intention is to remove at least one department to the east end each year, as the firm is cramped for space in its downtown factory.

With the coming of spring there is a movement among the mining men, and soon operations on many properties on the coast and in the interior will have been resumed. F. T. Hamshaw, a large operator in Atlin, is taking with him a considerable quantity of machinery. D. A. Matheson, general manager of the Yukon Basin Gold Dredging Company, and the Stewart River Gold Dredging Company, closed a deal for the construction of a large dredge, which will be shipped north.

New Companies.

McBurney Lumber Co., Toronto; capital, $50,000; to manufacture lumber. Incorporators, J. McBurney, H. H. Shaver and Jno. Gray, Toronto.

Novelty Woodworking Co., St. John; capital, $20,000; to manufacture lumber. Incorporators, H. R. Ross, J. H. King and H. E. Figsby, St. John.

Union Bag Co., Montreal; capital $99,000; to manufacture all kinds of bags. Incorporators, M. Jacobs, H. F. Watson and H. S. Williams, Montreal.

Northern Explosives Co., Montreal; capital, $250,000; to make explosives. Incorporators, A. J. Brown, R. C. McMichael and P. O. McMurtry, Montreal.

Blairton Iron Mines, Toronto; capital, $40,000; to crush ores, etc. Incorporators, J. L. Ross, A. W. Holmsted, T. A. Silverthorn, all of Toronto.

Sanders & Bell, Ltd., St. Thomas; capital, $40,000; to manufacture woodenware. Incorporators, A. R. Sanders, F. C. Bell and Ada E. Sanders, St. Thomas.

The Lindman Truss Co., Montreal; capital, $50,000; to make trusses and artificial limbs. Incorporators, A. Lesage, J. T. Finnie, and A. R. Griffith, Montreal.

The Perfect Skewer Co., West Toronto; capital, $40,000; to manufacture woodenware. Incorporators, S. W. Hooper, R. E. Black, and D. Kennedy, West Toronto.

The Rixon, Ainslie, Stoddart Co., Owen Sound; capital, $[illegible]; to operate saw-mills. Incorporators, H. Rixon, J. G. Ainslie and W. Stoddart, Owen Sound.

Dawson & Co., Montreal, capital $75,000; to manufacture hydraulic and electrical machinery. Incorporators, J. A. Dawson, C. G. Buch, T. B. Gould, all of Montreal.

Continental Oil Co., Winnipeg, capital $50,000; to carry on wholesale and retail oil business. Incorporators, T. Anderton, E. Liebel, J. Anderton, all of Oil City, Pa.

Household Economy Co., Toronto; capital, $40,000; to manufacture household articles. Incorporators, A. C. Bedford-Jones, R. W. Hart and O. H. King, Toronto.

Church & Fee, Montreal; capital, $450,000; to engage in saw-milling and pulp-making. Incorporators, T. E. Fee, E. S. Fee, St. Hyacinthe, and G. H. Church, Montreal.

Luttrell Gold Separator Co., Woodstock, Ont., capital, $100,000; to manufacture mining machinery. Incorporators, W. T. Parke, J. D. Luttrell and J. D. Hood, Woodstock.

L. J. Hetu, Ltd., Lanoraie, Que., capital, $75,000; to manufacture boots, trunks, etc. Incorporators, L. J. Hetu, Lanoraie, and A. Ecrement, J. B. D. Legare, Montreal.

The Canadian Vault Co., Toronto; capital, $50,000; to manufacture caskets and burial vaults. Incorporators, E. C. Davis, O. H. Holderer and C. W. Holderer, Toronto.

H. L. Bowers, Ltd., Port Hope; capital, $40,000; to manufacture building, foundry and sanitary supplies. Incorporators, H. T. Bush, A. E. Pipher and H. L. Bowers, Port Hope.

Superior Mfg. Co., Toronto; capital, $40,000; to manufacture stamps, stencils, tools, dies and machinery. Incorporators, W. E. Irons, G. Pettet, Toronto, Jos. Wheeler, Hamilton.

Filters, Ltd., Toronto; capital, $40,000; to manufacture filters and contrivances for purifying water. Incorporators, W. H. Warrington, N. B. Darrell, J. R. L. Starr, all of Toronto.

The Nasmith Baking Machine Co., Toronto; capital, $100,000; to manufacture ovens and machines for baking. Incorporators, J. D. Nasmith, A. H. Rodgers and S. Turner, Toronto.

Canadian British Insulated Co., Montreal, capital, $50,000, to manufacture wires, cables and electrical apparatus. Incorporators, L. S. F. Grant, J. J. Creelman, H. Brown, all of Montreal.

Simplex Concrete Piling and Construction Co., Montreal, capital, $75,000; to engage in contracting business. Incorporators, E. J. McCuaig, G. E. McCuaig, C. H. Lewis, all of Montreal.

Mexican Northern Power Co., Montreal; capital, $10,000,000; to carry on business of electric light, heat and power company. Incorporators, W. J. White, A. W. P. Buchanan, Saumarez, all of Montreal.

The Waste Products Refining Co., West Toronto; capital, $35,000; to manufacture and clean engine waste and make oils, paints, etc. Incorporators, G. H. Bostock, J. F. Mitchell, R. J. Richardson, all of Toronto.

The Hill Electric Switch and Mfg. Co., Montreal; capital $20,000, to manufacture machinery connected with electrical uses. Incorporators, J. J. Dougherty, N. Desjardins, J. DeG. Beaubien, E. J. Turley, all of Montreal.

The Brantford Foundry and Development Co., Brantford; capital, $40,000; to manufacture iron casting machines, implements and tools of all kinds. Incorporators, W. B. Burrill, J. B. Rouse, and J. Moffatt, Brantford.

Producer Gas Construction Co., Toronto; capital, $200,000; to manufacture oil and gas machines and devices for use of light, heat and power. Incorporators, H. R. Ivor, J. R. L. Starr, J. H. Harvey, all of Toronto.

Ben Hur Truck Co., Hamilton; capital, $20,000; to manufacture hand trucks, furniture, boxes, metals, plated ware, wheels, etc. Incorporators, F. R. Close, W. M. Findlay, T. A. Henderson, C. H. Snyder, all of Hamilton.

Watt Hose and Pipe Coupling Mfg. Co., Woodstock; capital, $100,000; to manufacture couplings, nuts, screws, brass goods, machinery, and hardware specialties. Incorporators, W. J. Watt, G. E. Phillips, J. A. McDonald, all of Woodstock.

A charter has been granted to the Labrador Pulp & Paper Company, Montreal, Que., capital, $1,500,000. Incorporators, E. Hutcheson, J. A. Richards and B. Stephens, all of Montreal, Que., and R. Smith and E. H. Weatherall, both of Westmount, Que.

Trade Notes.

The Dominion Foundry Supply Co. are installing an electric traveling crane in the O'Brien Mine at Cobalt.

The mines at Cobalt are again showing signs of activity. A great deal of machinery is being installed in many of the mines.

The Parkin Elevator Co., of Hespeler, have completed the work of replacing fire escapes on the Galt town hall and opera house.

The Crocker-Wheeler Co's tender for machinery required for Edmonton's powerhouse extension was accepted, the price being $[illegible].

M. Beatty & Sons, Welland, Ont., have received from the Dominion Dredging Company an order for a large dredge, 42 feet wide, 120 feet long, and 11 feet deep.

The Winnipeg Electric Railway Company have awarded to J. A. Dawson, of Montreal, a contract for 30 brill steel trucks for new cars now in course of construction.

The Goulds Pump Company, Montreal, have booked an order from the T. Eaton Company, Toronto, for eight triplex electric pumps to operate their elevator plants in Toronto and Winnipeg.

The following firms tendered for castings, etc., for Victoria's waterworks: Victoria Machinery Depot, B.C. Foundry & Engine Works, and Adams & Parsons. The Victoria Machinery Depot were awarded the contract as lowest tenderers. Contract for fire hydrants was awarded to Hutchinson Bros.

The Hamilton Steel and Iron Company has received an order for about twenty carloads of steel for one of the Hill railway enterprises that is being conducted in the North-West. The order comprises about 300 tons of steel angle irons for connecting rails, and about 160 tons of spikes for spiking rails to the ties.

Northern Engineering Works, Detroit, have recently supplied traveling cranes to Black Hills Traction Co., Deadwood; one 3 ton to the New Phoenix Foundry & Machine Co., Springfield, Mo.; one 15 ton to the City of Oswego, Oswego, N.Y.; and two 7½ ton traveling cranes to the Western New York Construction Co.

The Schaake Machine Works, New Westminster, has completed its first consignment of twenty Johnston shingle machines which were ordered by the Davidson Ward Lumber Company for its mill at Loughborough Inlet. The machines will be installed under the superintendence of Mr. Whitney, of the Whitney Engineering Company, of Tacoma.

The Ontario Wind Engine & Pump Co., Toronto, manufacturers of Gravity Molding Machines, have sold one large power machine to the G.T.R. Montreal Shop, also one to Messrs. Reid & Brown, foundrymen, Toronto. The C.P.R. are also now installing one at Winnipeg. This company have also sold two "Parks" Molding Machines, to Canadian Foundrymen. These two types of Molding Machines are manufactured in Canada.

The Montreal Water Committee have awarded the contract for a steel flume, with a sluice gate, to the John McDougall Company for $[illegible],639. The two large sluice gates, about nine feet in diameter, for the new water conduit were given to the Coffin Valve Company, of Boston, for $2,556. Both tenders were the lowest. Some thirty-inch and thirty-six-inch gate valves were divided up between Drummond, McCall & Company and the Canadian Fairbanks Company.

The Hamilton Fire and Water Committee awarded contracts for supplies for the department. Those for pipes and castings were: Tallman Brothers, lead pipe at $4.40 a hundredweight; Gartshore-Thomson Pipe Foundry, cast iron pipe at $32.50 a ton, castings at $1.95 a hundredweight; Fairbanks Company, valves at $39.29 a hundred for 12-inch, $9.45 for 6-inch, and $6.18 for 4-inch; Smart-Turner Company, hydrants at $44.70 a ton; Alexander Hardware Company, jute packing at 7½c.

Herman Boker & Co., New York, have established a branch office in Montreal at 332 St.

The New Grand Trunk Locomotive Shops at Stratford

General Description, Showing Arrangements of Shops and Their Construction, Including Structural Steel and Foundations on Concrete Piles.

ROBERT PATTERSON, MASTER MECHANIC, STRATFORD SHOPS.

The G. T. R. have recently completed shops at Stratford, Ont., which, though not the largest, are among the finest in Canada. The new plant consists of a machine and erecting shop 616 ft. x 175 ft., a boiler shop 135 ft. x 154 ft., and a power house 90 ft. x 108 ft. The power house and the machine and erecting shop are connected by a pipe tunnel made of reinforced concrete. In addition to the buildings just described, there is contemplated in the future the erecting of a foundry, 110 ft. x 140 ft. and a pattern shop 50 ft. x 120 ft. It is also proposed to run a yard crane from the foundry to the machine and erecting shop. All these various buildings, etc., are shown in plan, which also shows the older buildings, consisting of the tender shop completed in 1904, the offices, the storehouse, blacksmith shop, carpenter shop, brass foundry, plate shed, tube and pipe shop, etc. It also shows position of turntables.

The wall are reinforced concrete of a strong and massive design. The structural steel was installed by the Canadian Bridge Company, of Walkerville, Ont., and the general construction was accomplished by Mr. B. V. Hole, of London, Ont.

The structural steel work consists of plate, angle and channel columns supporting roof trusses of the Warren type and plate crane girders. The steel columns are designed to carry the maximum roof, wall and crane loads with a fibre stress of 16,000 lbs. per square inch less the ordinary deductions for designing long columns. When crane thrusts and wind stresses are considered in addition, the total stresses are allowed to run up to 20,000 lbs. per sq. inch. In designing crane runway girders, careful consideration was given to the effect of the horizontal and vertical shear on the top flange rivets, due to heavy wheel concentration. The balcony in the light machine bay is designed to carry a live load of 350 lbs. per square foot.

The question of foundations required some study. The present shop plant is

W. D. ROBB
Supt. of Motive Power.

EARL H. FITZHUGH.
Third Vice-President.

CHARLES M. HAYES
General Manager.

built upon a fill varying in depth from 10 to 15 feet below final floor level. After some consideration and comparison of various designs, it was decided to use concrete piles for the seven bents of the boiler shop and the west eight bents of the machine and erecting shop. These piles were driven in groups of from three to six each under the building columns. They were finished off about three feet below the floor level, at which point a reinforced concrete cap was built up to an elevation 2 feet below floor line, which elevation was adopted for the base of steel columns. The wall foundations were carried between these concrete pile footings and were reinforced so as to act as concrete beams. The concrete piles ordinarily carry a load of from 15 to 20 tons each; the maximum load with all cranes fully loaded and full snow load on the roof being between 35 and 40 tons on each pile. A test was made of one of these foundations and the same was found to be satisfactory under the above loads. The longest pile driven in was 20 feet, others varied in length from 12 feet. The remainder of the foundations were designed with spread footings on basis of a soil pressure of 5,000 lbs. per square foot. These footings are carried down to the natural ground level and the wall footings are carried between them as concrete beams, as previously mentioned. In the first eight bents of the erecting shop, the engine pits are also supported on concrete piles, eight concrete piles being driven under each engine pit, each figured to carry a maximum load of 35 tons.

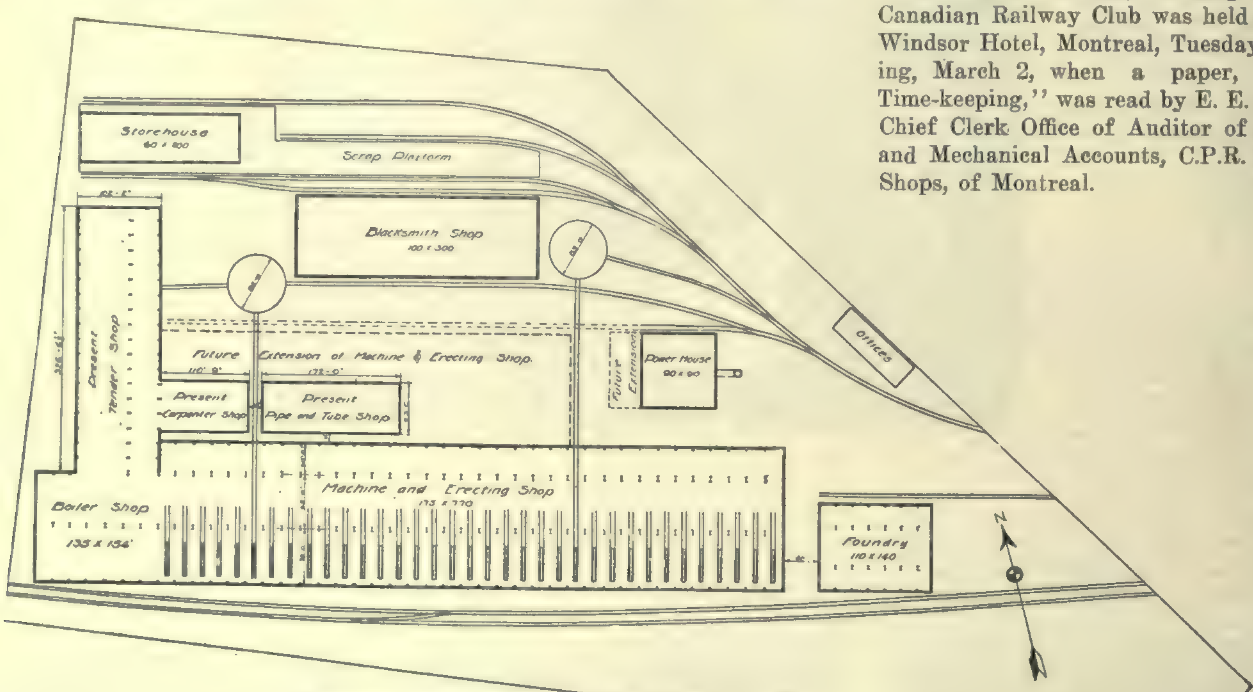
The men at the head of the G.T.R. who were responsible for the successful carrying out of the work were General Manager Charles M. Hays; Third Vice-President E. H. Fitzhugh, the head of the Construction, Motive Power and Transportation Departments of the G.T.R.; W. D. Robb, Superintendent of Motive Power, and Robert Patterson, Master Mechanic at Stratford, under whose personal supervision the work was carried on.

The Master Mechanic.

Robert Patterson, of the Stratford locomotive shops, received his primary education at the Model School, Toronto. He entered railway service in 1874 with the G.T.R. in the motive power department at Montreal, where he served three years of his apprenticeship. The remainder was served in the Stratford shops. He worked as a journeyman machinist at the Baldwin Locomotive Works, Philadelphia, from July, 1881, to April, 1882, when he returned to Stratford as foreman of the machine shop. In the same year he was appointed general foreman of the Midland Railway at Port Hope, and was locomotive foreman of the G.T.R. at Montreal from 1883 to 1887.

He was transferred from Montreal to Toronto as locomotive foreman, and made general foreman of the shops at Toronto in 1888, when the G.T.R. took over the Northern and Northwestern Railway. He was acting assistant master mechanic at Gorham from October to December, 1896.

In 1897 he was made general foreman of the shops as Port Huron, Mich., and the same year master mechanic of the G.T.R. lines west of the St. Clair. In February, 1889, he was transferred to Stratford as master mechanic of the shops, and now holds that position. It is an interesting feature that Thomas Patterson, father of Robert Patterson, was general foreman of the Stratford shops from May, 1871, to January, 1872, and July, 1877, to August, 1888.



GENERAL LAYOUT OF IMPROVEMENT ON LOCOMOTIVE SHOPS
STRATFORD, ONTARIO
GRAND TRUNK RAILWAY SYSTEM

CENTRAL RAILWAY & ENGINEERING CLUB.

The regular monthly meeting of the Central Railway & Engineering Club was held at the Rossin House, Toronto, Tuesday, March 16th. A paper was read on Car Heating, by C. S. Parker, representative of the Parker Car Heating Co., London.

CANADIAN RAILWAY CLUB.

The regular monthly meeting of the Canadian Railway Club was held at the Windsor Hotel, Montreal, Tuesday evening, March 2, when a paper, "Shop Time-keeping," was read by E. E. Lloyd. Chief Clerk Office of Auditor of Stores and Mechanical Accounts, C.P.R. Angus Shops, of Montreal.

The feature of the April meeting will be a paper on Snow Fighting, by A. W. Wheatley and T. McHattie. Mr. Wheatley is manager of the Montreal Locomotive Co., and Mr. McHattie is master mechanic, G.T.R.

The annual meeting will be held on Tuesday evening, May 11th, at the Windsor Hotel.

T. McHattie, formerly master mechanic of the Eastern division of the G.T.R. Montreal, has been appointed superintendent of motive power and car department on the Central Vermont Railroad, with headquarters at St. Albans, Vt.

Features and Equipment of the Machine Department

Machines Arranged in Groups to Facilitate the Handling of Work—Heavy Machines with Individual Motor Drive; Lighter Machines in Group Drive.

The machine, erecting and boiler shops are in one building. It is a self-supported, steel structure, reinforced with concrete walls. The total length is 770 ft. and the total width is 175 feet. There is no division between the machine and erecting shop and the boiler shop, the same runways being carried through both shops. The erecting and machine shop is 616 ft. in length, the erecting shop occupying the south aisle and the machine shop the centre and north aisles. The centre aisle has the service of two 10-ton cranes and the north aisle under the balcony is for belt-driven tools. Above the latter is a gallery used for heating fans, air brake department, brass, bolt work and other light machine work. All heavy machines in the centre bay of machine shop are driven with individual motors, but machines under and above the balcony are divided into nine groups. Each one can be run separately or a number can be coupled up and driven together. As the work of this shop is all specialized, each group contains its own particular machines for its special work, also the necessary fitting equipment.

Alternate columns of the heavy machine bay are provided with compressed air and electrical connections. Air is also provided along the north wall of the building and under the balcony. On every fourth column of the two middle rows of columns, water service connections are provided on the main floor and balcony.

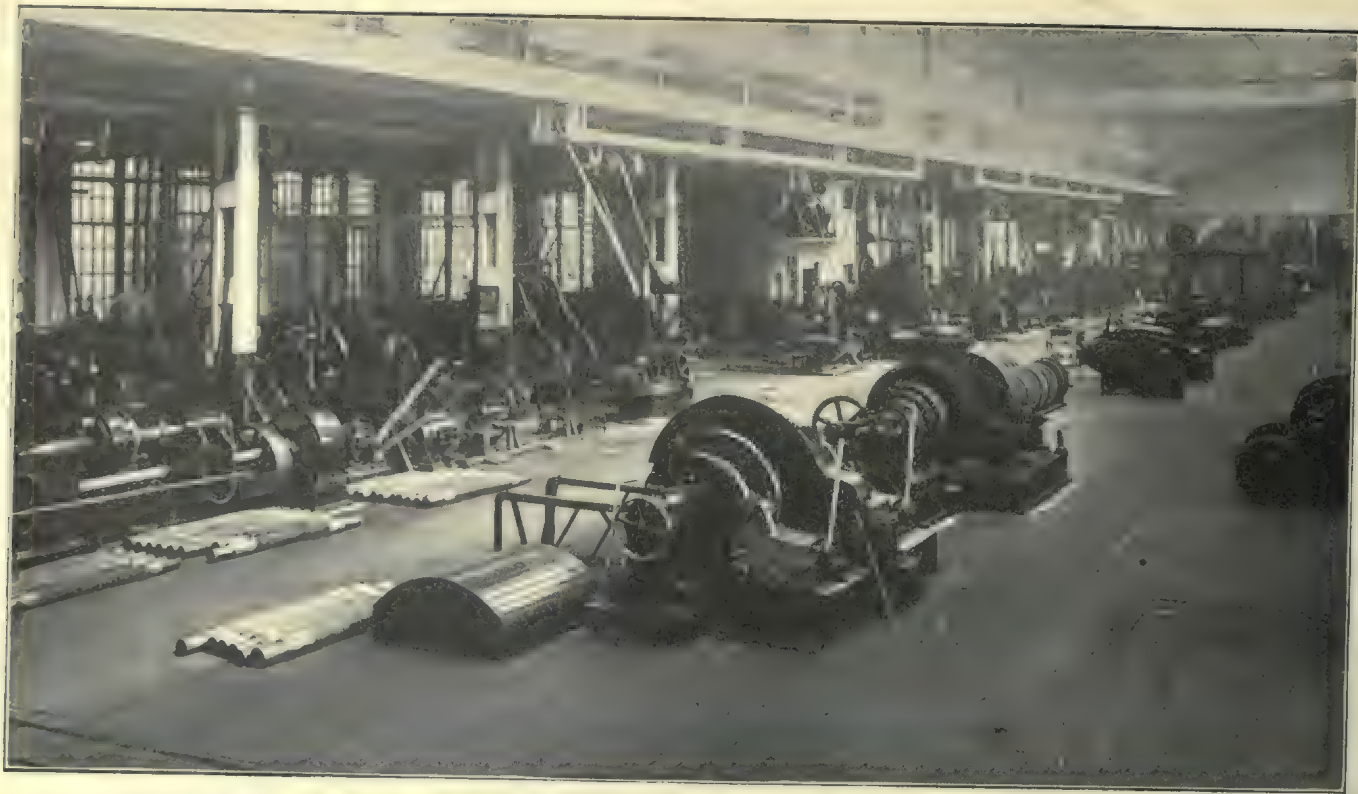
The Machine Department, Looking East. In the Foreground is Group No. 1 Consisting of a Boring Mill of the Barret Machine Tool Co., Meadville, Pa., the Cylinder Shaper, Made by Morton Mfg. Co., Muskegon Heights, and the Radial Drill Made by John Bertram & Sons.

Grouping of Machines.

To facilitate the handling of work the machines are arranged in eighteen different groups. The ordering of the machine tools and the arranging of them was under the supervision of Robert Patterson, master mechanic at Stratford. Some of the groups contain individual motor-driven machines, grouped to take care of different classes of work. If one special group has more work than ordinarily, there are groups for general work.

The machine tools have been arranged as follows: Group (1) for cylinders, (2) crossheads, pistons, valves, guide bars, etc., (3) motion work, (4) driving axles and wheels, (5) tire work, (6) axle boxes, (7, 8, 10, 11 and 12) general work, (9) truck wheels and axles, (13) frame and rod work, (14) main and siderod work, (15) brass work in gallery, (16) air brake work, (17) bolt work, and (18) tool work, small tools, repairs to tools, gears, cams, etc.

A chargeman is responsible for the



A View of the Machine Department Looking East. The Axle Box Department is Under the Gallery. An Axle Lathe is in the Foreground, also Truck Wheel Lathes. The Tracks in the Foreground at the right of the illustration Mark the Center of the Shop, East and West.

View in the Center of the Shop Looking West, Showing Some Large Tools Supplied by the London Machine Tool Co., Hamilton; and John Bertram & Son, Dundas. The Foreman's Office is Shown and the Heating Fans Situated in the Gallery Above the Men's Washrooms.

work in each group. This man is an expert machinist, well acquainted with the work done in his group. He exercises a general supervision, keeps the men fed with work and accomplishes a great deal himself.

One man is responsible for keeping the groups supplied with work and for the removal of it when it is completed. When the supply of tires at the boring mills is low, he brings in a new supply and moves the finished tires to the centre of the shop where the tires are expanded unto the wheels.

The general purpose machines are grouped in the centre of the shop under the gallery. All belt-driven machines have been placed so as to have uniform drives. The countershafts down stairs and in the balcony are parallel to the main line. All down belts are at a good angle.

placing a new tire on the machine and removing it when it is finished.

To show the facility with which the castings to be machined are handled, the cylinders may be taken as an example. The rough castings are brought in on a supply track and are moved by the ten-ton crane to the marking off table in front of the boring machine. They are then set up on the Barret cylinder-boring machine shown in the illustration, then on the Morton cylinder shaper and boring machine, and, finally, to the Bertram radial drill, where the cylinders are finished. These machines constitute group 1. Other groups are similarly arranged so that a casting is machined with the least possible handling.

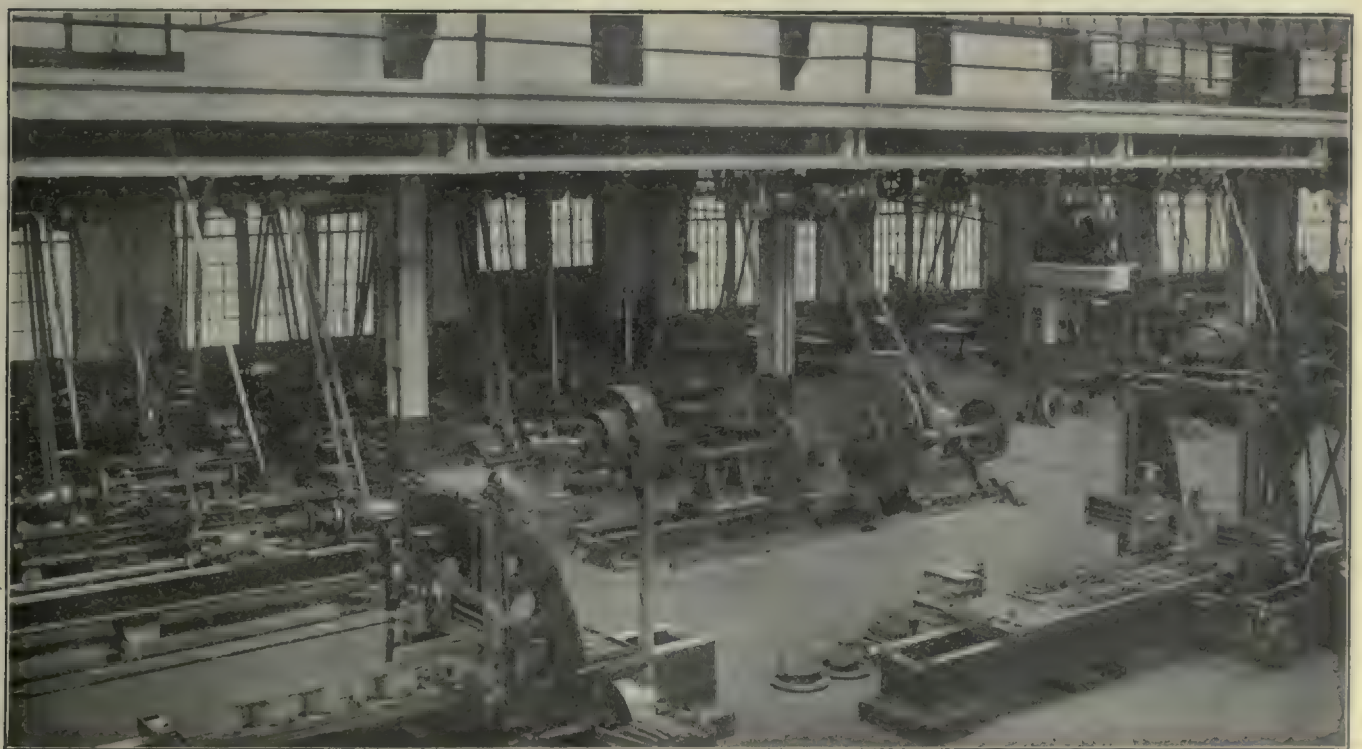
Barret Boring Machine.

With this machine the cylinders require only one setting and piston valve using a table this machine may be used for milling axle boxes, slab milling and general milling.

Three motors operate the machine. One raises and lowers the head and gives transverse motion. A 15-horse power motor drives the ram for cutting. A small air compressor, motor-driven, is attached for balancing the head. This air compressor works automatically with automatic contact.

John Bertram Equipment.

Among the large motor-driven machines supplied by John Bertram & Sons, Dundas, are No. 8 bending rolls, 72 in. radial drilling machine, double back geared engine lathe, slotter, planer, 24 in. double head shaper, Pond coach wheel lathe, driving wheel lathe, punch, etc.



A View of the North-East Corner of the Machine Department Looking Under the Gallery where the Connecting Rods are Machined and Fitted, Being Made Ready for the Erecting Department.

All heavy tools are in the centre bay or aisle, so that work can be handled by the ten-ton crane. The heavy machines are all on concrete foundations. A feature of the motor drive is that they are low speed, 335 R.P.M., with the main shaft running at 180 R.P.M. in the case of the six-group drives. Jib cranes are arranged at points along the shop for the handling of material independent of the electric crane. For instance, there is a jib crane serving the boring mills of Bertram & Sons and the London Machine Tool Co. These boring mills are for tires and the jib crane is used for and cylinder may be bored at one setting. A Lincoln Motor Works variable speed motor is connected by a Morse chain. The speed of this motor may be varied from 300 to 1,200 R.P.M. by moving the armature across the poles.

Morton Cylinder Shaper.

This is a combination machine for boring the holes in the steam chest, milling the ports and planing the face of the steam chest. This is all done without removing the cylinder from the chucks. It is very accurate and can be used for drilling all small holes. By

Tools From London Machine Tool Co.

The London Machine Tool Co., Hamilton, have supplied a number of large motor-driven machines, including a slab miller, 8 ft. boring mill, axle lathe, journal lathe, tire lathe, etc.

The London Machine Tool Co.'s 90-inch wheel lathe was designed for heavy work and gives good satisfaction. The machine is a massive one and weighs 102,000 lbs. It is driven by a 60 h.p. variable speed motor, and for moving the left-hand head it is equipped with a 5 h.p. motor. A full description of this

wheel lathe with tests appears on pages 43 and 44 of the May, 1908, issue of Canadian Machinery.

Other Machine Equipment.

The rest of the equipment includes a T. C. Dill slotter, several Smith & Coventry machines, Dunn Hattersby truck wheel lathe, Hilles & Jones plate planer, Wm. Sellers & Co. grinding machines, Brown & Sharpe's milling machine, Becker Brainard milling machine, two 36 in. Gisholt boring mills, one 42 in. Gisholt boring mill, etc. A 500-ton press for pressing wheels on axles forms part of the equipment.

Expanding Tires.

A system is used for expanding tires to put them on the wheels which does away with the use of coal and the consequent gathering of ashes, etc. Rings slightly larger than the tires are put over them and are connected to gasoline tanks by rubber hose.

The gasoline is contained in tanks and is fed to the rings in which are numerous small holes, under pressure. The holes are drilled in the iron pipe so that the flame plays on the steel tire. This system is found to work well. When a tire is expanded sufficiently, the iron rings are put away and the job is proceeded with, without having to clean up the remains of a fire.

Chain Drive.

One of the features of the machine department is the application of chain drive to many of the machine tools, the Morse system having been installed.

Among the machines thus connected are planers, 42 in. truck wheel lathe, slab milling machine, six spindle stay bolt cutter, two spindle drill, sheet iron bending rolls, etc.

A ten horse power motor is connected to a London Machine Tool Company's slab milling machine by chain. The motor operates at 565 to 1130 R.P.M., milling machine at 239 to 478 P.P.M., chain, 9 in. pitch 3 in. wide operating over 19 and 45 teeth on 24⅝ inch centers, maximum feet per minute, 1610.

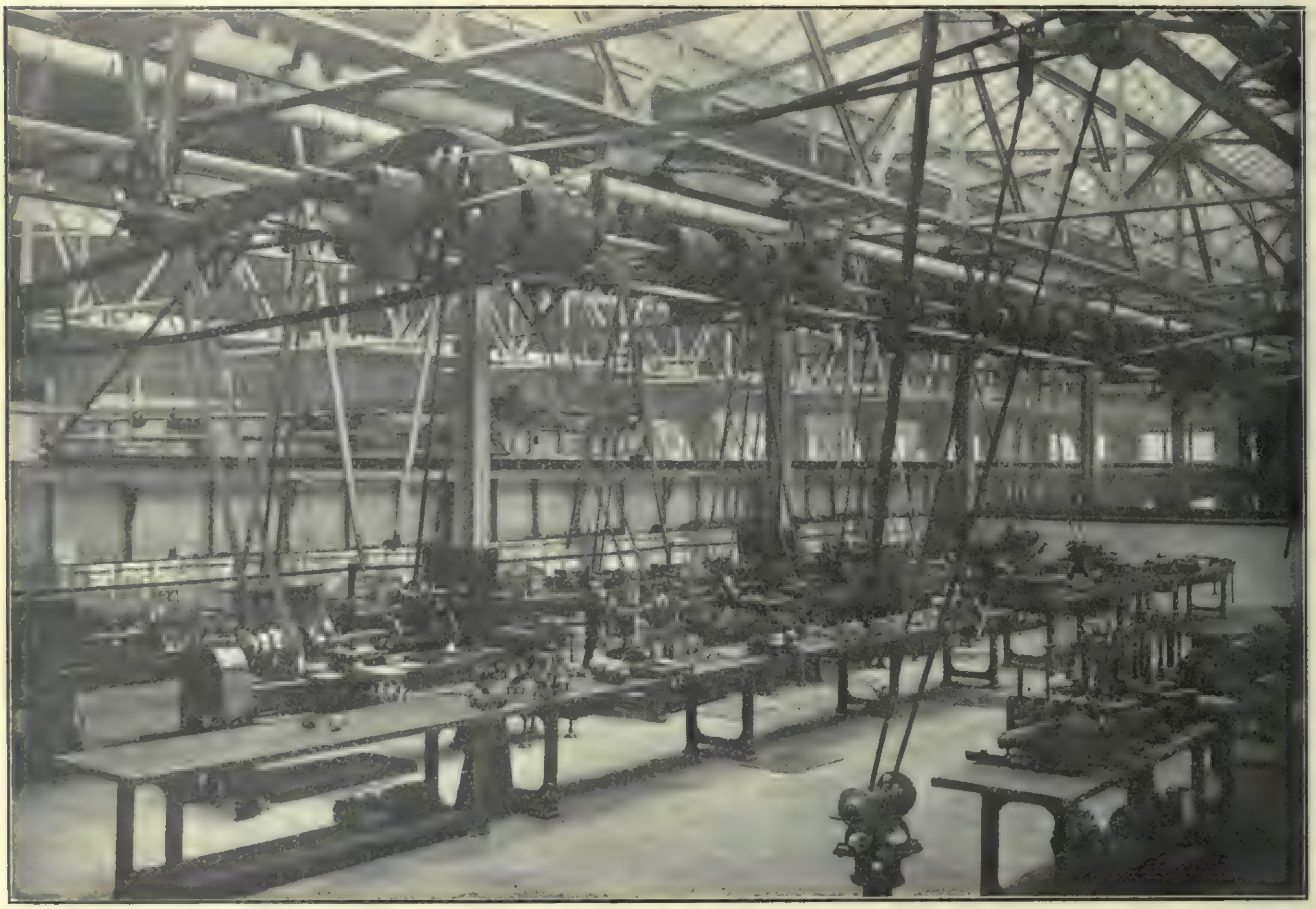
A 3½ H.P. motor drives a Bertram sheet iron bending rolls through chain, motor operating at 975 P.P.M., rolls at 160 R.P.M., chain 9 inch pitch, 1 inch wide operating over 15 and 91 teeth on 33 inch centers, 1100 feet per minute.

Ten countershafts are thus driven through Morse chain varying in lineal velocity from 952 to 2280 feet per minute, the width varying with the horse power of the motor and the work to be accomplished.

Chain drive is a silent drive. Though the first cost is found to be dearer than other forms of connecting motors to the line shafts or individual machines, the upkeep is very low and the system is economical.

The Gallery.

The gallery contains the brass department, air brake department, tool room, bolt department and template room. The Sturtevant heating fans and coils are also situated in the gallery.



The Brass Department in the Gallery, Showing the Arrangement of Machinery and Countershafts for Group Drive. This Arrangement is Carried out in all the other Group Drives.

A view of the brass room is here shown. There is a stores department connected with the brass department, and all finished material is given out by the man in charge, on receiving an order signed by the foreman of a department. The illustration serves to show the arrangement of the group-driven machinery.

The bolt department contains bolt threaders, lathes, turrets, and a bolt stores, where finished and unfinished bolts are kept. These are also given out on receipt of an order from a foreman.

The template stores contain the tem-

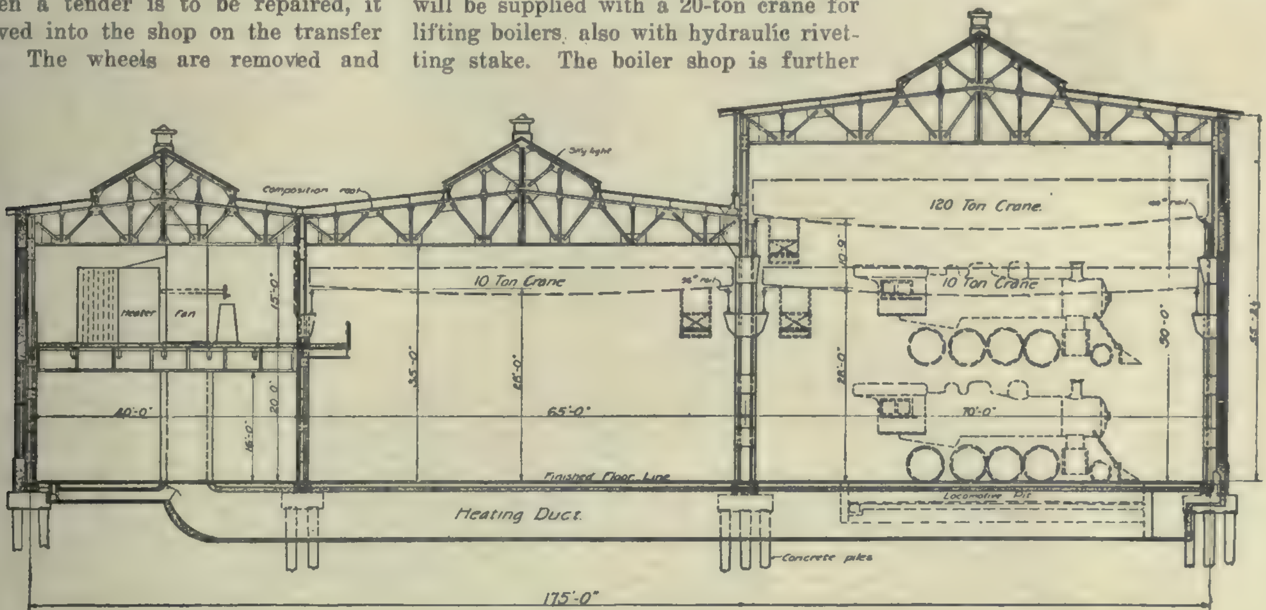
plates for the many jobs requiring them. The templates are in charge of an expert who designs new ones as required. The templates are given out by check and the man receiving one is responsible for it until it is returned.

In the air brake department the apparatus is carefully tested and receives a more severe test than when in actual service. A complete train equipment for thirty-five cars may be tested.

In the tool room are tool grinders, milling machines and other necessary tools for the repairing of tools, gears, etc. The tempering of the small tools is also accomplished in this department, but the larger tools are forged and tempered in the forge shop.

Tender, Boiler, Erecting and Other Shops

Elevated Tracks in Tender Shop; Overhead and Jib Crane Service in Erecting Shop and Other Special Features of the Shop Equipment.



CROSS SECTION
of
MACHINE & ERECTING SHOP

Projecting north from the main building is the tender shop. This building is 325x103 feet and holds eighteen tenders. A 25-ton crane serves the tender shop. A transfer table runs the length of the tender shop.

When a tender is to be repaired, it is moved into the shop on the transfer table. The wheels are removed and taken to the elevated tracks where a workman may do the necessary repairing without bending over his work. The tracks are raised a height of 18 inches above the floor level in the two bays devoted to tender truck wheels.

Boiler Shop.

This shop is located on the west end of the machine and erecting shop, and is provided with stalls located on 22-foot centres. The shop is composed of two bays, one 70 feet wide and the other 65 feet wide. The 70-foot bay is served with a 30-ton crane, which runs upon a continuation of the 120-ton crane-runway of the erecting shop. This is also served with a 10-ton messenger crane running below the 30-ton crane. The 65-foot bay is provided with a 10-ton crane. No rivetting tower has been provided in the present designs and if same is required in the future, an extra half bay will be built on the west end of the boiler shop, to the necessary height. This will be supplied with a 20-ton crane for lifting boilers, also with hydraulic rivetting stake. The boiler shop is further provided with flange and plate furnaces, which connect with flues in the west wall of the boiler shop. These flues are built inside pilasters of the building, being in cross-sectional area 18x24 inches, with walls eight inches thick extending a short distance above the roof line. Four such chimneys are provided in the west end of the boiler shop. The boiler shop is also provided with two test pits, 24 feet long and four feet wide, for testing boilers. These are located in the south-west corner of the building, adjacent to the flange furnaces.

Erecting Shop.

The erecting shop occupies the south bay of the main building shown in the accompanying section of the machine and erecting shops. There are 28 pits with 22-foot centres and provision has been made to extend it to 35 pits when necessary.

One foreman is in charge of the erecting shop. The work is divided up and a chargeman is responsible for the work alotted to his group. There are four gangs (1) one taking care of the steam chests, cylinder faces, slide bars and crossheads; (2) steam pipes and exhaust pipes, etc.; (3) mountings, dome covers, etc., and (4) stripping. The boiler work is under the supervision of the boiler shop.

The small work is conveyed by four-wheeled lorries. In shops such as the smith and forge shops, or in the yards, these run on tracks but no tracks are necessary for them in the erecting and machine departments.

The erecting bay is 70 feet in width. Locomotives enter and leave the building from the north side and a 35-foot and an 85-foot turntable are used in conveying the locomotives to and from the shop. The engine pits are provided with water, steam and compressed air connections. Electric lighting connections are also provided.

Jib cranes are arranged along the south side and also along the columns of the north side next the machine shop. The jib crane service is one of the features of the new shops. When the electric crane delivers castings to the erecting shop, the jib cranes are used to put the pieces in position. They are also of service in dismantling the locomotives.

The entire erecting shop is served with a 120-ton crane, capable of lifting the heaviest locomotive to a height clear of locomotives on the main floor, and

carrying same to any part of the shop desired. This method of handling is illustrated in Fig. 1. Directly below the 120-ton crane runway is a messenger crane of 10 tons' capacity, for handling the various parts of locomotives such as drivers, trucks, engine frames, etc., which parts are not heavy enough to justify the use of the larger crane.

In order that the 120-ton crane may serve the last engine pit at the east end of the erecting shop, a pocket is provided for the 10-ton messenger crane by building an extra half-bay on the east end of the shop, to a height sufficient to allow the 10-ton crane to pass on beyond the last pit.

Smith and Repair Shops.

The smith shop is mostly devoted to spring work. This part of the works, including the forge shop and specific repair shop at the south of these two shops, were erected in 1904.

The specific repair shop contains two lines of tracks and will accommodate six locomotives or steam shovels requiring light repairs. There are two drop pits so that a pair of driving wheels may be removed without dismantling the locomotive. This shop is served by a small traveling crane in addition to jib cranes and a lorry track.

The tube shop is in a separate building at present, but provision has been made for it at the east end of the machine shop. The building at present used as a tube shop will be converted into a carpenter shop with the necessary equipment, including wood planer, band saw, lathe, drill, shaper, boring machine, grinder, etc.

The brass foundry is well equipped for the work required. For melting the brass two rotary brass furnaces with oil as fuel are used.

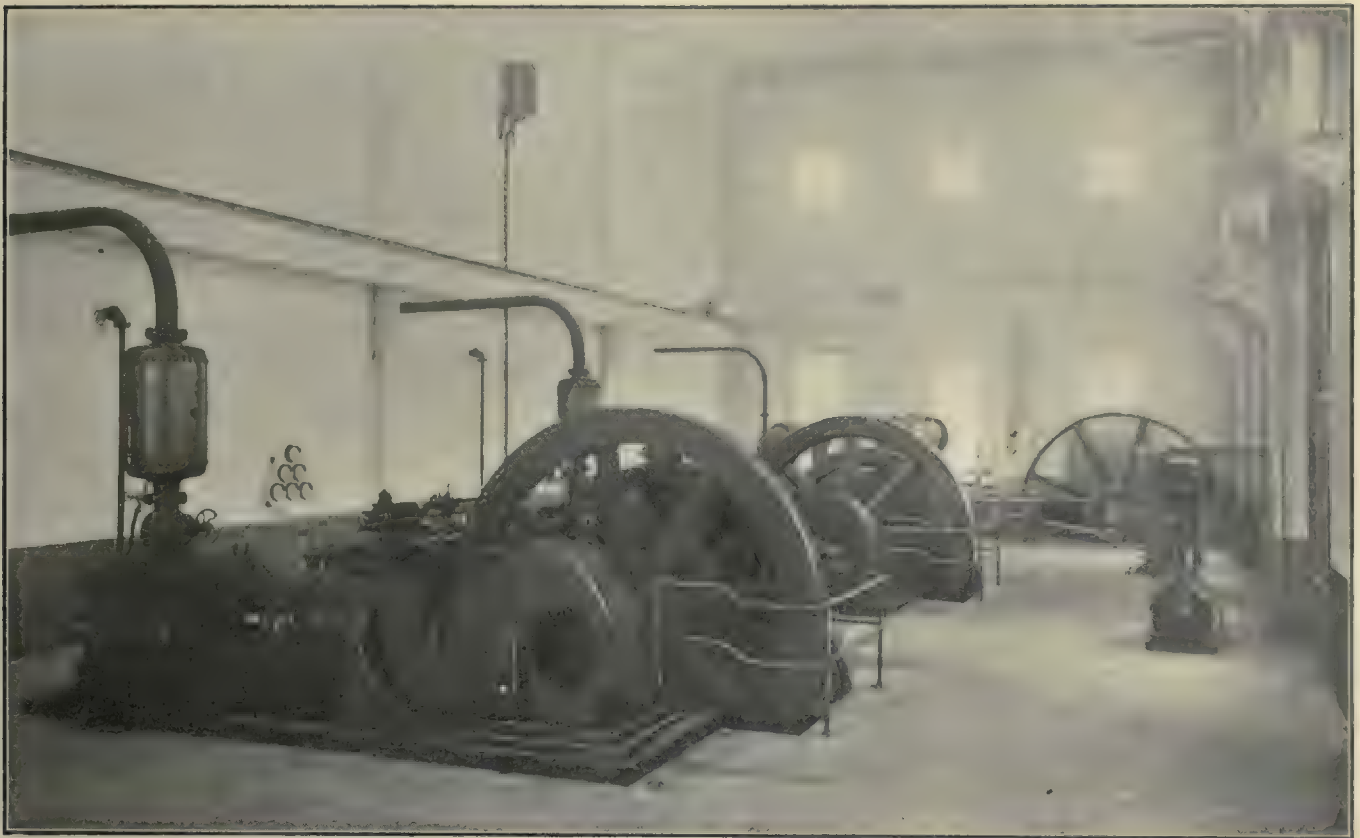
Interior of Erecting Shop, Showing Construction Large Locomotive Crane and General Arrangement of Pits. The Crane Lifts the Locomotive and Moves it to the Track Desired.

ELECTRIC SMELTING.

Dr. Haanel, Director of Mines, has received a letter from the directors of the Electric Smelting Company at Ludvika, Sweden, whose guest he was last summer, announcing that the experiments then begun with a model electric smelting plant, following the design evolved by Dr. Haanel, have proven an entire success. The company has now made a contract for the installation by the summer of an electric smelting plant on a commercial scale for the production of pig iron. This will be the first one in the world to actively inaugurate electric smelting on a commercial basis. It is another proof that the new system, which means so much to the future of the iron industry of Canada, is commercially feasible, and will doubtless be followed by the installation of similar plants in this country.

RAILWAY ENGINEERS' CONVENTION.

William McNab, assistant chief engineer of the G. T. R. was elected president of the American Railway Engineering and Maintenance of Way Association at the tenth annual convention held in Chicago recently. More than 300 operating and engineering experts employed by the railroads of the United States and Canada are attending the convention.



Engine Room Showing Goldie & McCulloch Engines and Rand Air Compressor.

Central Power House Equipment, G.T.R. Shops, Stratford

Vertical Water Tube Boilers, Stokers, Coal Handling Plant, Engines, Generator, Pumps, Piping, Heating System, Etc.

The power house is a self-supported steel structure, reinforced with concrete walls, 90 feet by 108 feet. All walls and foundations below the ground line have been water-proofed.

There have been four vertical boilers installed, each being 350 h.p., a total of 1,400 h.p. Foundations have been built for two more boilers which will bring the capacity up to 2,100 h.p. Green traveling chain grates and stokers are used, operated by small vertical engine.

The coal is dumped from the cars, and passing through a crusher, is conveyed to a steel receiver holding 250 tons of coal. Bucket conveyors carry the coal to the receiver from which it is conveyed by gravity to the different hoppers of the stokers. The same buckets remove the ashes and dump them into cars.

A Weber chimney 175 feet above the ground, or 187 feet, total height, furnishes draft to the four boilers, and is of sufficient capacity to take care of the additional two. The flue is 7 feet 6 inches.

The boilers work at 160 lbs. pressure. The header is 14 ins. diameter. From the header to the Goldie & McCulloch engines is a 7 in. steam pipe, 7 in. to Robb-Armstrong, 4 in. to each Waterous, McEwen and 5 in. to the Rand air compressor. All steam piping has been carefully covered by a good insulating covering.

A 20 H. P. motor drives the flue cleaner through Morse chain, motor operating at 690 R.P.M., flue cleaner at 440 R.P.M., chain 9 inch pitch $3\frac{1}{2}$ inch wide, operating over 21 and 33 teeth on 22 inch centers, 1090 feet per minute.

The Engine Room.

The main units in the new engine room are two large Corliss Goldie & McCulloch compound engines, 19 and 34 X30 in. These are fitted with Sight Feed Oil Pump Co.'s oilers on the cylinders, and have independent steam gauges. The bearings are oiled by a gravity system. All the oil is returned to a Burt filter and pumped to an overhead tank where it is again ready for use. The low pressure cylinders are fitted with outside tail rests or shoes to keep the piston in alignment and from wearing the bottom of the cylinder.

These engines are each connected to a 400 k.w. Western Electric generator. The engines run at 150 r.p.m., and current generated is 220 volts d.c., direct current being used throughout the works.

In the foreground, but not shown in the illustrations, is being installed a Robb-Armstrong 18 and 28x24-in. This engine was in the old power plant and will be direct connected to a Westinghouse 300 k.w. generator.

In the rear of the power house is a Rand air compressor and between it and the Goldie & McCulloch engines are being installed two Waterous-McEwen engines, which were in the old power plant. These engines are direct connected to 35 k.w. Canadian General Electric generators.

The Canadian Rand air compressor is steam-driven and an interesting feature of its construction is that the air cylinders are in the centre. The fly-wheel has been arranged for rope drive so that at any time the Corliss steam cylinders

may be disconnected and motor drive installed. This machine will compress 2,200 feet per minute and has water-cooled air cylinders.

Two gauge boards on the wall are for the air compressor and general purposes. The general purpose board has a clock, gauges showing main and exhaust, air pressure, vacuum and water pressure. The other gauge board shows the vacuum, high and low steam and high and low air. An Allis-Chalmers-Bullock motor balancing set of 20 k.w. has been installed, which reduces the voltage from 220 to 110, the voltage required by the Cooper-Hewitt system of lighting. With this exception, 220 volts is used throughout the shops.

The switchboard is Western Electric, and contains all the necessary equipment for the completed plant. It consists of nine panels of blue Vermont marble. There are four generator panels, one full load panel with Westinghouse graphic recorder wattmeter and ammeter. Provision has been made for taking the reading of any switch on the board. The equipment of this panel includes a differential voltmeter for the Allis-Chalmers-Bullock motor generator set. One panel is the equalizer, two power panels and one lighting panel. The instruments on the panels are Weston, with Canadian Westinghouse switches.

from a tank situated in the yard. Water is pumped to the tank from the Little Lakes, 2½ miles east of Stratford, by a plant owned by the G.T.R. situated at the lakes. Water may be drawn from the city in case of emergency.

Two vacuum pumps take care of the heating system, either being able to do the work. The returns are pumped into a Cochrane heater and from there to the boiler. The boiler feed pump operates automatically. The pumps will be equipped with revolution counters so that the work of each pump will be registered. The piping is of Crane design, the whole pump house equipment being supplied by the Canada Foundry.

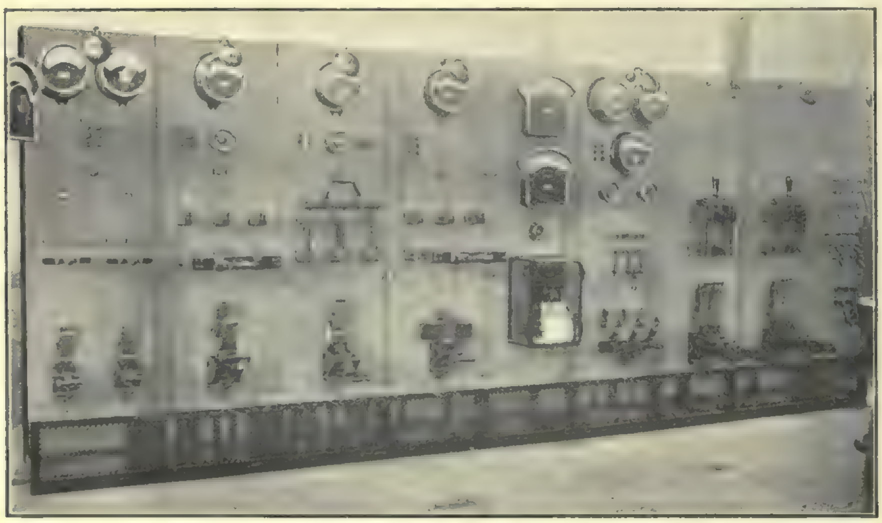
Piping System.

Piping from the power house to the shop is carried through an underground tunnel. The air pipes and power cables are also carried through this tunnel.

A separate system of piping is installed for drinking water, which is obtained from artesian wells, drilled on the shop site.

Water service lines loop all the buildings and provide fire protection, there being three yard and 30 shop hydrants located at points to cover every part of the works.

The entire building is heated by indirect radiation, utilizing exhaust steam from the power house in heaters. It may be necessary at times to assist the supply of exhaust steam by turning the live steam into the heaters, through a reducing valve. Three Sturtevant fans are operated by small horizontal engines the exhaust steam from which passes into the heating coils as an additional assistance to that supplied from power house. The experience up to the present time is that this system will provide ample heating requirements for the cold weather. The circulation of air throughout the shop is very good, keeping at the same temperature for the most part.



Switchboard in Engine Room, G.T.R., Stratford.

A ten-ton Smart-Turner traveling crane forms part of the equipment of the engine room.

Pump Room.

Two boiler feeding systems have been installed. A pump is used and each boiler is fitted with an inspirator, which is used as an auxiliary. Two boiler feed pumps have been installed, but either one is of sufficient capacity to supply the boilers.

A 100,000-gallon pump supplies the shops with water. This water is drawn

The air is taken in from outside by means of fans driven by small horizontal engines, exhaust steam of which also passes into heat coils. Fans, heaters, and engines are located on the balcony of the machine shop, the hot air being distributed through a system of underground reinforced concrete ducts with openings in walls and in ends of locomotive pits on the south side of the building. A small heating duct is also provided under the balcony and underground on the north side of the building, having vertical outlets through the floor.

The interior view of the power house, shows engines, air compressor and other equipment. A view of the switchboard, showing the equipment of it to control the lighting and electric power for the various shops, is also given.

G.T.R. STRATFORD ROUNDHOUSE.

The Stratford roundhouse has a very important relation to the work of the road at this point. It is a brick structure, situated in the large yards east of the station, and contains twenty-seven stalls where the iron horses are groomed and put in condition to go out again after each journey.

The engines enter from the west side to the turntables in the central space from which the stalls radiate. This turntable is driven by a little compressed air engine, which is charged from time to time as needed, from the reservoir in the roundhouse. To turn an engine to the track leading to the particular stall to which it is to be taken, the operator pulls a lever, and by another turn stops it when the desired point is reached.

Compressed air is used for cleaning engines, as motive power for tools, testing air brakes in the yard, and to apply pressure to the stores of oil beneath the store room. When any kind of oil is needed for use all that is necessary is to turn a tap. The pressure of air is regulated by a valve, so that while there may be 100 pounds at the reservoir, it can be reduced to 5 in the store room. There are three boilers and a stationary engine in the roundhouse, used to supply the compressed air, heat the building and wash out the boilers.

For the feeding of engines with water and coal, good provision has been made. The three tanks, two at the station, and one in the yard near the roundhouse, hold 100,000 gallons of water each.

The coal chutes in connection with the roundhouse are of up-to-date construction. Engines can be loaded with coal from both sides at the same time, and the spouts which carry the coal to the tender are so regulated that any quantity from one to twenty tons can be taken as desired.

System for Looking after Welfare of Employes

Conveniences for the Workmen, Lockers in Sufficient Numbers, Wash Basins, Etc. The G.T.R. System of Instruction of Apprentices.

In the arrangement of the G.T.R. shops the welfare of the men has been carefully looked after. It has been the policy of the G.T.R. to do this as the men appreciate the provision made for their comfort.

A sufficient number of lockers are provided for each workman in the shop, designed on the basis of 18 workmen per engine pit. One wash basin is provided for every four men. These lockers and wash basins are located in lavatory rooms directly under the heating fans. These rooms consist of two floors, ten-foot ceilings. This arrangement makes the lavatories and lockers easily accessible from both the main floor and 5the balcony, stairs being provided immediately adjacent to these rooms, extending from the main floor to the balcony.

The equipment of these rooms, consisting of basins and other conveniences, were supplied by the Standard Ideal Co., Port Hope. The illustration shows one of the wash rooms. Fountains are provided through the shops, the water being pumped from artesian wells, drilled on the site.

The health of the men is provided for. Not only has sanitary equipment been provided, but a Railroad Y.M.C.A., provided with baths, swimming pools, etc., is accessible to the employes.

Rooms are provided for instruction of apprentices who meet every Tuesday and Thursday. Six teachers give instruction in mechanical drawing and practical mechanics. During the day the chargemen look after the apprentices in their gangs.

These rooms contains an oven where the dinners of the employes are warmed. The employes can then sit down at a table and have their hot soup or tea.

Apprenticeship System.

The first requisite in employing an apprentice is to know that he is morally, physically and mentally capable of filling the requirements of a mechanic. In order that this may be ascertained the apprentice is required to make his application direct to the master mechanic or general foreman. He must be not under fifteen nor over eighteen years of age, and he is required to undergo a medical examination to assure the head of the department that he is healthy and likely to be able to follow up the trade after he has completed the term of apprenticeship. After this the candidate is required to pass an examination in the master mechanic's office.

As a test of eyesight the applicant must be able to read extracts from instructions at the end of an employe's train time table printed in very small type, standing at a distance of thirty inches from it and as a test of hearing he must be able to hear the ticking of an ordinary open face watch at a distance of four feet. There are prescribed tests of writing and spelling from dictation and tests in figures sufficient to show whether the applicant has a general knowledge of the simple elements of arithmetic.

The candidates are required to write this examination out on foolscap paper and, if satisfactory, it is copied by him into the record book kept in the master mechanic's office so that a complete record of the boy's ability is kept from the day he first enters the service. All apprentices, it may be remarked, are indentured to the various trades for five years. Five cents per day is deducted from each apprentice and the total amount is returned to him at the expiration of his apprenticeship with an addition of twenty-five dollars as a bonus if services have been entirely satisfactory.

Night Classes and Exams.

The apprentices are required to attend a night drawing class and a class in applied mechanics for six months in the year—from October to April—and there are few absentees. Attendance at these classes is compulsory and a satisfactory explanation must be given by an apprentice who is absent on any night.

Every April examinations in drawing and applied mechanics are held over the entire system. The papers for the examination are prepared by James Powell, chief draughtsman, at Montreal, and the company gives prizes for each class of apprentices at the different shops —a prize for each successful competitor in the first, second, third, fourth and fifth year apprentice examinations. Then there is one general prize for the whole system, the class obtaining the highest number of marks being awarded it, and there is also an individual prize for apprentices getting the highest number of marks over the whole system.

The system, in which Master Mechanic Patterson, of Stratford, takes a deep interest and does all he can to advance, insures thorough education in all details of the trade. The apprentices go from the boiler shop to the machine shop, from the machine shop to the motion bench, the side rod bench, the axle-box gang, the steam pipe gang, the valve gang, and, finally, the erecting gang, so that after an apprentice is out of his time he is a specialist in any of these branches. The system of apprentices has not only resulted in the boys getting a better education, but has elevated the moral standing of their work.

The system has been made attractive to boys who have passed the high school entrance examinations, and who, well-advanced along the lines of school education, adopt the mechanic's trade in preference to other pursuits. The company offers inducements to remain to those they have trained, and many high positions in the service are occupied by old apprentices.

Interior View of one of the Workmen's Washrooms.

System is the Key-note in the Stratford Shops

All Tools Can be Accounted for, Messenger and Telephone Systems are Being Installed, and a Premium System of Rewarding Workmen is in Use.

A central tool room has been provided for the machine shop with a separate one for the boiler shop. There is also a central stores in the machine shop and the same system of giving out tools, etc., is used in these three as well as the template room.

At present if a workman wants a tool he gives a check with his number and becomes responsible for the tool until it is returned, when he again receives his check. A list of the men with their numbers is kept in the tool room so that the man in charge can tell when he is giving the tools to the proper persons.

Telephone System.

A telephone system is at present being installed, in order that a mechanic will lose no time going after tools. Telephones are being installed in the offices, store departments, tool rooms and various other departments. A telephone will be supplied to every two gangs in the erecting shop.

When a mechanic requires a tool, blue print, etc., he telephones to the proper department and a messenger is at once despatched with it. It is the same if he requires something from the stores department. If a tool requires forging, the workman telephones for a boy who takes the tool to the forge shop and returns it when it is ready. In this way a workman loses no time.

The Stores.

The main stores is separate from the main shops, and contains about a month's supply. All the supplies are arranged so that any article may be obtained without any delay. Everything is arranged for quick handling. The oil tanks are underneath the floor, but compressed air has been applied to the pumping of it and supplies of oil are quickly obtained.

In the machine department there is a central stores where about a week's supply is kept. When the telephone system is in working order messengers will deliver supplies as required.

A watchmen's system is being installed. They will carry portable clocks and keys will be arranged so that all parts of the shops will be covered. At present a check system is in use similar to that described in the February issue of Canadian Machinery, but plans are being made for a new system.

Premium System.

A premium system of rewarding the employes is in use. Prices are set for the different work and on the completion of the work the mechanic receives his bonus. If a workman gets behind on a job he must give satisfactory reasons, for the prices set are given according to past practice, taking into consideration any extra work, such as erecting, more faces to machine, extra fitting, etc.

On large work where a long time is required to finish a number of pieces, a premium is paid when half the number is completed. The chargeman who is responsible for the work in a certain group also shares in the premiums. This system is found to work very satisfactorily.

Everything is systematized. The scrap metals are arranged according to quality in bins in the yard to facilitate loading, all work is passed through the shops with the least possible handling and schemes carefully planned out beforehand. This is seen from the manner in which the new shops have been designed and the machinery placed. The saving of time is a great item when locomotives are to be repaired and the system adopted in the several departments at the Stratford shops facilitates the making of repairs and assists in accomplishing work quickly.

TO DETERMINE ACTUAL PLANER SPEED.

The following is taken from a catalogue describing the high-speed planers made by Bateman's Machine Tool Company, Limited, Leeds, England:

The old practice of judging the comparative values of planing machines, by comparing their speeds on cut and return, has been found very misleading. This is because of the momentary stoppage of the table at each end of the stroke and the time lost before full speed is attained after reversal. In some machines these losses are very considerable and materially reduce the productiveness of the tool, and if such machines were sped up, the loss on reversal would be enormously increased. The only accurate means of ascertaining the earning capacity of a planer is to take the cycle time, as indicated below.

Time of cycle = time of 1 cut + time of 1 return.

L = length of stroke in feet.

T = time of N cycles in seconds.

N = number of cycles.

Average (or earning) speed =

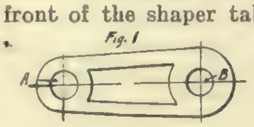
$$\frac{2L \times N \times 60}{T}$$

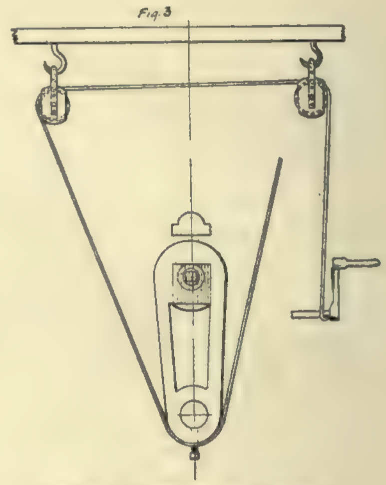
Thus a 42-in. by 14-ft. machine completes 10 cycles in 3 minutes 56 seconds (236 seconds) when on a 14-ft. stroke. Therefore, the average speed is

$$\frac{14 \times 2 \times 10 \times 60}{236} = 71 \text{ ft. per minute.}$$

PLANING CIRCLES ON A SHAPER.

It was my good fortune to see a rig for planing circles on a shaper a few days ago, says a writer in Modern Machinery. This arrangement was so ingenious and simple that I describe it for the benefit of those of your readers who may have occasion to use it in "their business." Fig 1 (A and B) shows the casting to be planed. Fig. 2 shows a forging that is bolted on the front of the shaper table. A collar was





Planing Circles on a Shaper.

made to fit tight (moderately) in the holes A and B, but loose on the forging bolted to the table. A small set screw was run in the oil holes leading to A and B and attached to the set screw in the loose end of the casting was a small wire cable leading to a couple of pulley blocks, fastened to the ceiling and leading down to the feed on the shaper and fastened to the feed bar. The cable wound around the feed bar as it eevolved and pulled the casting around at each stroke of the machine with the same precision as on a plane surface.

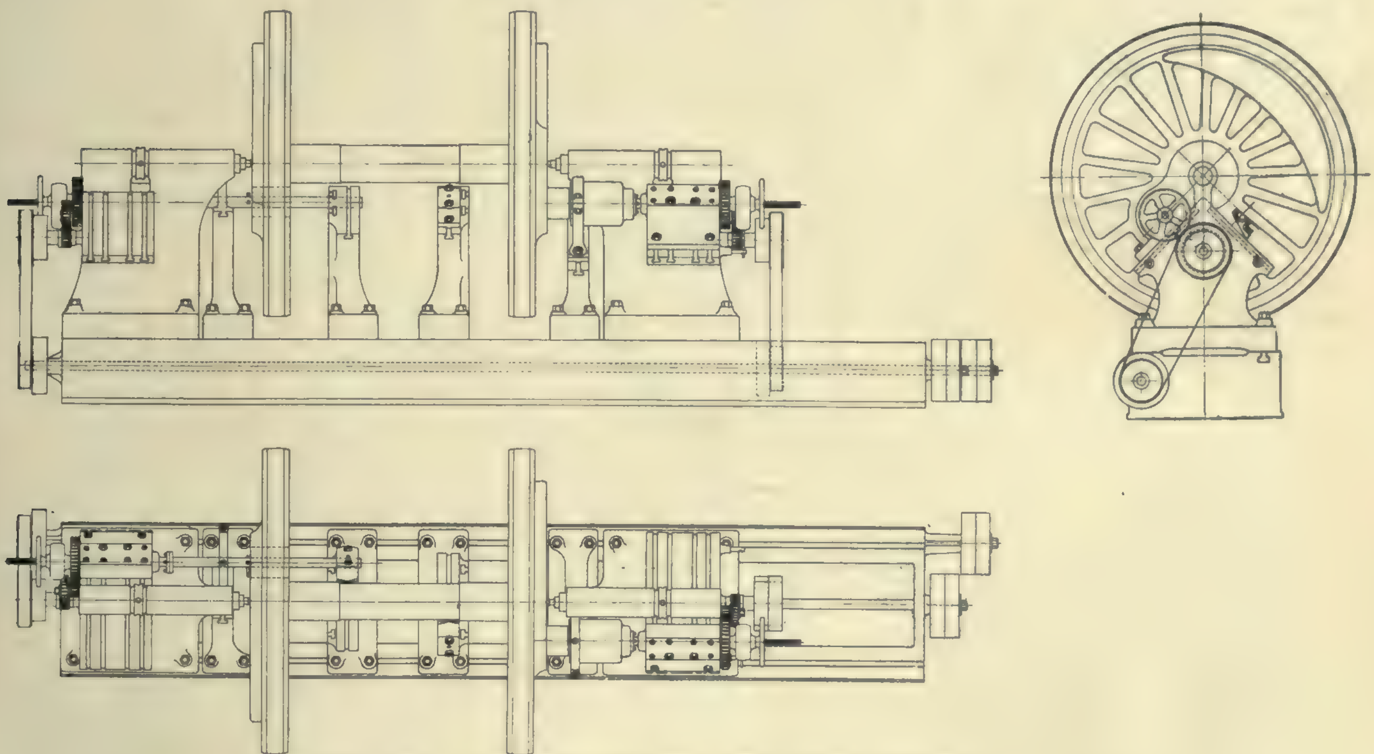
When one-half the circle was planed the cable was unwound and taken out of both blocks and passed up again through the block above the feed and the same process repeated. The plan was very ingeniously thought out and did perfect work. Fig. 3 shows the whole arrangement. A large washer and cap screw screwed in the end of the forging bolted to the table served to keep the casting in place.

Quartering Machine at Grand Trunk Shops, Stratford

The Arrangement of Driving-wheel Quartering and Crank-pin Turning Machine, Showing the Details of Tools used for the Purpose.

One of the most interesting machines in the Stratford shops is a driving-wheel quartering and crank pin turning machine. The original machine was supplied by Craven Bros. and the attachments by which both the boring and turning are accomplished were designed and constructed at the Stratford shops.

Both operations, boring the crankpin holes and turning the crankpins, are accomplished on this machine. The wheels are placed in position as shown in the half tone and also in the line drawing. It will be noted that on the right is shown the arrangement for boring the crankpin holes in the driving wheels. The two wheels are bored at once by the boring bar arrangement shown.



Elevation, Top and End View of the Driving Wheel Quartering Machine.

Turning Crankpins.

From boring crankpin holes to turning crankpins the change may be made in a few minutes. Two, three or four tools may be used to turn a crankpin and as two crankpins are turned at once, four bearings may be turned in one operation.

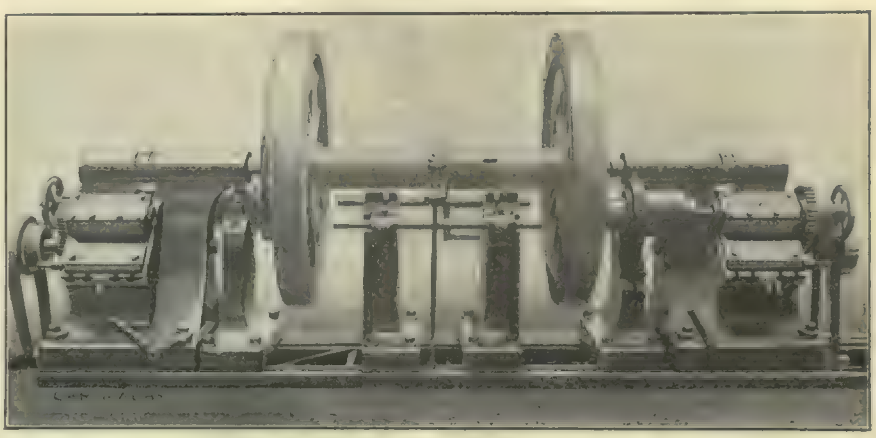
The crankpins are turned perfectly in quarter and both crankpins are turned at the same time. If wheels come in for repairs and the crankpins are found to be out of true, they are turned up. Crankpins are never removed from driving wheels for repairs. If for any reason a crankpin must be repaired a new one is put in its place.

The right hand head shown in the line drawing of the machine is equipped for turning crankpins. The machine has a capacity of from 22 inch to 32 inch stroke. With it, crankpins are turned in parallel with the centers of the axle and correct quartering is ensured.

Details of Turning Head.

The second line cut shows the details of the crankpin turning equipment for the driving-wheel quartering machine. The cast iron head is bolted to the shaft in the same manner as the boring bar. Inserted in the head are steel bushings to hold the tools. The arrangement of the tools in the head is here shown.

A supplementary brass bearing supports the boring bar through the turning head bearing when boring crankpin hubs. This bearing is shown at the right in the line cut of details. The construction of the machine itself with the arrangement of driving gear may be seen from the line cut and half tone.



Driving Wheel Quartering Machine Fitted with Crank Turning Arrangement.

PERSONAL.

Mr. A. F. McArthur, city engineer of Guelph, has been appointed city engineer for Yorkton.

L. A. Candall has accepted a position with J. W. Paxton, Philadelphia, as manager of their western branch.

Messrs. S. Gagne, and Gordon T. Jennings, B.Sc., have opened an office as consulting engineers in the Lawlor Building, corner Yonge and King Sts. Toronto, Ont.

J. A. Coulter, president and manager of the John Morrow Machine Screw Co., is the new chairman of the Ingersoll Board of Trade.

G. Hebb has been appointed road foreman of the Central division of the C. P.R., vice A. West, appointed district master mechanic at Kenora, Ont.

Mr. J. R. Heddle, late assistant city engineer at Hamilton, Ontario, has been appointed city engineer of Brandon, Man. Duties to commence not later than May 1st.

J. H. Mills, formerly district master mechanic of the C. P. R., at Farnham, Que., has been appointed acting master mechanic on that road, with headquarters at West Toronto, Ont.

F. Rowlandson, formerly locomotive foreman on the C.P.R. at Brownville Jct., Me., has been appointed locomotive foreman on that road at West Toronto, Ont.

J. R. Spragge, formerly district master mechanic on the C.P.R. has been transferred to the Ontario division of that road, with headquarters at West Toronto, Ont.

J. Kenneth Craig, lately with the Windsor, N.S., Foundry, has received the appointment of manager and secretary-treasurer of the Bridgetown Foundry Co in the place of his father, the late W. A Craig.

Mr. Dix-Fraser, superintendent of the blast furnace plant, at Port Arthur, has returned from a trip to some industrial centres in the United States. He says his company intend to operate their plant again this spring.

R. Livingston Fernbach, chemical engineer, whose headquarters were formerly at Boston, advises us that he has opened general offices at 97 Warren street, New York City, and is maintaining laboratories at Brooklyn, Boston and Montreal.

The duties of mechanical engineer, locomotive branch, at the Angus shops of the Canadian Pacific Railway at Montreal, heretofore performed by A. W. Horsey, who has been appointed master mechanic on that road at Smith's Falls, Ont., will hereafter be carried on by Mr. G. I. Evans, chief draughtsman.

J. C. McCarty, of Brooklyn, N.Y., president of the Canadian Tool & Shovel Co., visited the Hamilton plant recently. He was accompanied by his son, E. W. McCarty, who is a director of the company, and his brother, Right Rev. Monsignor McCarty. They are interested in asbestos mines in Quebec.

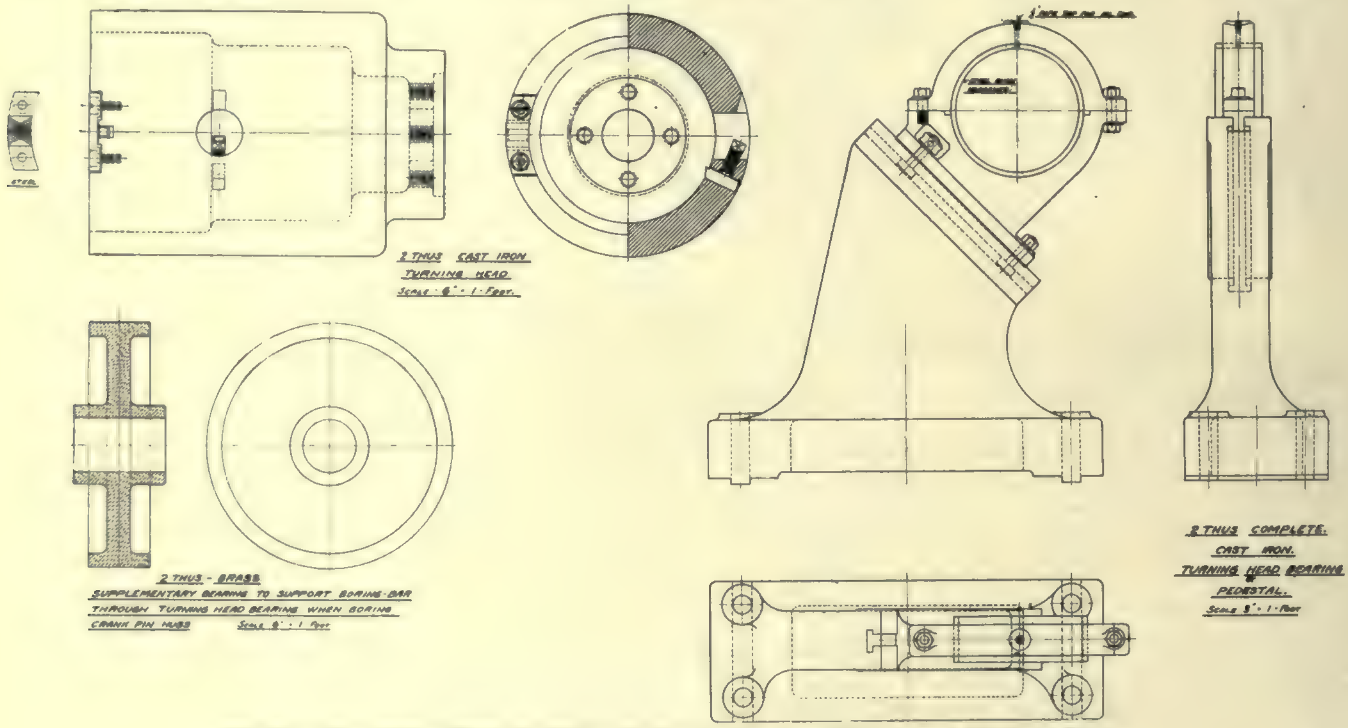
A. H. Eager, formerly district master mechanic on the C.P.R. at Kenora, Ont., has been appointed locomotive foreman on that road at Calgary, Alta.

J. C. Garden, formerly general shop foreman on the G.T.R., at Toronto, has been appointed master mechanic on that road at Montreal, Que.

J. Duguid, who has been appointed general foreman G.T.R. shops, Toronto, was presented with a gold watch, Feb. 20, by the employes of the machine and erecting shops, Stratford, Ont., on his leaving there to assume his new duties. At the same time Mrs. Duguid was presented with a silver tea service.

George W. Robb, former general foreman of the Grand Trunk machine shops at Ottawa, was recently made the recipient of a handsome cabinet of silverware from the employes of the shops The presentation was made owing to the fact that Mr. Robb was leaving for Winnipeg, where he is to occupy the position of assistant master mechanic of the Grand Trunk Pacific.

Mr. J. F. B. Vandeleur, 3 Dineen Building, Toronto, Canadian agent for Messrs. Reavell & Co., Ipswich; Gilbert Arc Lamp Co., Chingford; Laurence, Scott, Norwich; Evershed & Vignoles London, and several other well-known English firms, has just returned from England after a three months' business trip. While abroad Mr. Vandeleur called on his different principals, and the prospects for the development of trade relations between English engineering concerns and Canada look promising.



Details of the Driving Wheel Quartering Machine Designed and Built in the Stratford Shops..

Adoption of a Standard Thread for Taps and Dies

A Proposal to Eliminate the Old V Thread for Taps and Dies; Advantages of U. S. Standard for Bolts, Nuts, Railroad Work, Etc.

For a number of years the tap and die makers have had under consideration the advisability of discontinuing the regular manufacture for stock of V-thread taps and dies, and the general adoption of the United States Standard or Sellers form for all 60-degree screw threads.

The "V-Standard" No Standard.

The V-standard so called is a "standard" existing only in theory; in practice the V-thread, nominally an equilateral triangle in section, is flatted at the top an amount varying with the practice of the different manufacturers. It is, of course, recognized that the slightly flatted top is an essential feature of this thread, as it is a mechanical impossibility to maintain the size of a tap with perfectly sharp threads while a single hole is being tapped; the removal of the metal during the operation causing the sharp tops to be worn away and the original diameter to be lost almost from the outset.

Difference in Diameter.

In cutting down the V-thread in the tap, some makers stop at one point, some at another. One concern may cut down to a pitch diameter 0.010 inch over the theoretical size, believing that the flat thus left at the top of the thread presents just sufficient surface to give satisfactory results; while another manufacturer may cut the thread a little deeper, and still another not quite so deep. No two work to the same dimensions and the result is that the actual thread diameters, measured in the V, differ with every make. This fact is well illustrated by the accompanying table which gives the diameters adopted by various makers whose names and products are known throughout the manufacturing world.

A comparison of these figures with the true or theoretical pitch-line diameters of the perfectly sharp V, as given in the fourth column from the right of the table, will reveal some interesting irregularities. The values in this column are equivalent to the outside diamter of tne threaded piece less the depth of a single thread, as computed by the formula:

$$\text{Pitch diameter equals } D - \frac{0.866}{P}.$$

where P equals the number of threads per inch and D the outside diameter. The columns headed A, B, C, etc., represent the actual sizes worked to by the different tap manufacturers. Thus in column A will be found the diameters adopted by one concern, while column B shows the practice of another maker; and so on across the table.

Size Threads	A	B	C	D	E	F	G	H	I	J	Theoretical Diameter of Sharp V Thread Measured in the Angle.	Pitch Diameter U. S. S.	Actual Pitch Diameter of One Makers V Thread.	Difference Left to Tap Out.
1/4—20	0.2107	0.217	0.214	0.2147	0 212	0 209	0 2147	0 214	0 217	0 217	0 2067	0 2175	0 2107	0 0068
5/16—18	0.2683	0.275	0.275	0.2724	0 270	0 267	0.2724	0 2755	0 2755	0 2745	0 2644	0 2764	0 2683	0 0081
3/8—16	0.3264	0.331	0.332	0.3290	0 327	0 325	0.3289	0 333	0 331	0 3315	0 3209	0 3344	0 3264	0 0080
7/16—14	0.3822	0.386	0.386	0 3836	0 382	0.380	0.3836	0 3875	0 388	0 386	0 3756	0 3911	0 3822	0 0089
1/2—12	0 4351	0.438	0.441	0.4378	0.4355	0 434	0 4358	0 442	0 439	0 441	0 4278	0 4459	0 4351	0 0108
9/16	0.4963	0.500	0.501	0.5003	0.4978		0.4983	0.50125	0 502	0 500	0 4903	0 5084	0 4963	0 0121
5/8—11	0.5525	0.556	0.559	0.5563	0 554	0.554	0 5543	0.55925	0 559	0 558	0 5463	0.5659	0 5525	0 0134
11/16	0.6153	0.619	0.625	0.6188	0.6168		0.6168	0 6217	0 622	0 6245		0.6285	0 6153	0 0132
3/4—10	0.6702	0.673	0.671	0.6734	0.6715	0.671	0 6714	0 6715	0.677	0 671	0 6634	0.6850	0 6702	0 0148
13/16	0.7321	0.736	0.732	0.7359	0 734		0 7339	0 734	0.7395	0 7315				
7/8— 9	0.7875	0.789	0.795	0.7888	0.788	0 788	0.7868	0.796	0.796	0 795	0 7788	0.8028	0.7875	0 0153
15/16	0.8495	0.851	0.854	0.8513	0.8508		0.8493	0.858	0.858	0.8535				
1— 8	0.9017	0.902	0.900	0.9018	0.902	0.901	0.8998	0.991	0.910	0.900	0 8918	0.9188	0 9017	0 0171
1 1/16														
1 1/8— 7	1.0103	1.011	1.024	1.0113			1.0021	1.0135	1.022	1.022	1 001	1.0322	1.0103	0.0219
1 3/16														
1 1/4	1.1347	1.136	1.146	1.1363		1 137	1.1271	1.1385	1.147	1 145	1 126	1.1572	1.1347	0 0225
1 5/16														
1 3/8— 6	1.2422	1.241	1.251	1.2407			1.2387	1.243	1.249	1.249	1 230	1.2667	1.2422	0 0245
1 7/16														
1 1/2	1.3678	1.366	1.378	1.3675		1.368	1.3637	1.368	1.376	1.377	1.355	1.3917	1.3678	0.0239
1 5/8— 5	1.4646	1.462	1.473	1.4618			1.4598	1.464	1.472	1.4715	1.467	1.4951	1.4646	0 0305
1 3/4	1.5878	1.587	1.581	1.5868			1.5848	1.589	1.597	1.5795	1.576	1.6201	1 5878	0 0323
1 7/8— 4 1/2	1.6904	1.693	1.692	1.6926			1.6928	1.6947	1.702	1.690	1.682	1.7306	1.6904	0 0402
2	1.8219	1.818	1.833	1.8176			1.8187	1.8197	1.828	1.831	1.807	1.8557	1.8219	0 0338

ANGLE SIZE "V" THREAD.

COMPARATIVE ANGLE SIZES OF "V" THREADS AS MADE BY DIFFERENT MANUFACTURERS OF TAPS.

Considering, for example, the 1/4-inch 20-thread size, the tabulated data show that this is made all the way from 0.0023 to 0.0103 inch larger than the standard pitch-line diameter; and, in the case of the 1/2-inch 12-thread, the range throughout the different lines is from 0.0062 to 0.0142 inch oversize in the thread angle. The 3/4-inch 10-thread dimensions show an increase over the theoretical diameter ranging with different makers from 0.0068 to 0.0136 inch and in the case of the 1-iach 8-thread size the oversize allowance is from 0.008 to 0.0182 inch. The variation for other sizes may be readily found by merely subtracting the values under the alphabetically headed columns from the corresponding sizes given in the column at the right of the table.

Advantages of the U.S. Standard.

There can be no question as to the supremacy of the United States standard form of thread. Devised over 40 years ago and recommended by the Franklin Institute for general adoption by engineers, it has become the standard of the United States Government, and is used by practically all the railroads, bolt and nut makers and progressive manufacturers.

In 1898, the International Congress of Engineers convening at Zurich, adopted this form of thread as the best for metric sizes and pitches, and it is now in almost universal use throughout the continental countries. More recently the Association of Licensed Automobile Manufacturers has adopted it as the standard of the organization, and in 1907 it was accepted by the American Society of Mechanical Engineers as the standard form of thread for machine screws.

For many years this standard form of thread with depth equal to Pitch X 0.6495, has been supplied by tap and die manufacturers, with practical interchangeability. The outline of the thread is such that it may be cut to the correct theoretical depth and to the true pitch-line diameter without the allowances found necessary when cutting the so-called sharp V-thread. It will be seen by comparing the pitch diameters of the United States Standard with even the largest of the V-thread diameters, that the United States Standard is a little larger in every case. This allows the retapping of any V-thread hole to bring it up to standard size, and avoids the necessity of discarding any machine parts but the screws or bolts.

Accurate Cost Keeping as an Aid in Manufacturing

Fourth Article on the Cost System Used by the Canadian Locomotive Company in which the Methods of Making the Labor and Material Summary are Described.

The summary of labor and material is what might be called the climax of the cost system. The whole system in use at the Canadian Locomotive Works, Kingston, has been carefully studied out so that when a contract for locomotives is completed, the cost of them is easily and quickly arrived at.

Card No. 1 is the form used in making the labor summary. The workman's number is filled in and the number of hours he is engaged in the work, opposite his number. These cards are filed under different contracts. Numbers designate the name of the part, these numbers being stamped at the top. For instance ash pans will be 1, ashpan details 2, etc. Each labor summary card

Form 1 PREVIOUS COST ......

LABOR.

OPERATION NAME OF PART

Contract ...... SKETCH / PATTERN / CARD No. ......

Commenced ...... Finished ......

No.	Hrs.	Hrs.	Hrs.	Hrs.	Hrs.	Hrs.	Hrs.	Tot. Hrs.	Rate.	Amount.

Fig. 1.—The Labor Summary Card.

pertaining to ashpan details will be numbered 2.

Each shop has its own color, the machine shop is white; boiler shop, yellow; carpenter shop, red; smith shop, green, etc. A glance will therefore show the cards belonging to each department. All the cards on ashpans are filed under that name and having the cards of a different color facilitates the finding of a card showing the work in a certain department. This applies to any part, as pistons, connecting rod brasses, etc.

The total labor in each department

Cost ......

Contract ...... Card No ......

No. Pieces	Material	Rough Weight	Price	Amount	Labor	Amount

Fig. 2.—Labor and Material Summary.

is then entered on card shown in Fig. 2. This is the card on which the total labor and material is entered. The amounts are then transferred to the final cost summary card, fig. 5. The premiums are added to the labor cards,

CANADIAN LOCOMOTIVE COMPANY (Limited)

Shop Requisition for Material

......190

To Storekeeper

Quantity	Description of Material	For What Purpose
	N.B.—Make but one entry on a card.	
Price		

Authority

Fig. 3.—Requisition Form.

Fig. 1, and the total on card shown in Fig. 2, is the total productive labor.

To get the total cost a percentage for non-productive labor and factory expenses is added to the total productive labor cost. The percentage is calculated on the productive labor. This percentage is also added to obtain the total cost of any part of a locomotive. By this system the labor cost on any part can be seen at any time.

The percentage added includes under

......Charged to Contract......

Quantity for......Engines......Card No......

Date	No. Pieces		Price	Amount	Date	No. Pieces		Price	Amount

Fig. 4.—Material Summary Card.

the heading of unproductive labor, the president, manager, foremen, office staff, draftsmen, watchmen, etc. They do not bring any direct income to the establishment, but are as necessary to the success of the business as the producers. The personality of the men and the system employed is a feature in the success of the business.

There are a great number of expenses under the heading of factory expenses, which are included in the percentage. These are insurance, taxes, depreciation, repairs to machinery and building, scrap pile, spoiled work, fuel, light, telephone, stationery, postage, telegrams, traveling expenses, freight, express, etc.

Material Summary.

When an order comes for a number of locomotives, the superintendent notifies the chief draftsman who, according to experience, calculates the amount of material required to fill all orders. This list is made in a standard book form and a copy is sent to the storekeeper who knows what material is on hand. A card system is used to show the material bought and material used.

The head draftsman gets out the necessary drawings and the foremen of the departments are supplied with them. All faces to be machined are marked, thus greatly facilitating the handling of work in the shops.

From the drawings the foremen make out their orders or requisitions, fig. 3, for material which is presented to the stock-keeper. These call for a certain amount of bar-iron, mountings, piping, etc., and must give the drawing number

and the name of the particular part of the locomotive for which the material is required.

When a contract is entered into, cards shown in fig. 4 are filled in at the top in the drafting office from the book of specifications. These cards are kept in the cost department and are filled in and checked off, from the requisition cards, fig. 3, which are delivered to the cost department by the store-keeper every day. The summary is made on cards shown in fig. 4. The final summary is made on card shown in fig. 5, the different items mentioned being self explanatory.

CONTRACT............

.... Locos. & Tenders.

For ....

Weight of Engine in Working Order ....lbs.

" " Light...............lbs.

" Tender " ....lbs

Tank Capacity ...... Imperial Gallons.

Labor $...........

Charges $...... Total Labor $......

Materials $...............

Charges $......Total Materials $....

Total Cost one E.& T. on Track in Yard $........................

Freight to .... $......

Total Cost of E. & T. Delivered $.....

Labor...per ct. of cost Material.....per ct. of cost

Cost per lb. in Working Order....cents
[Cost E. & T. by Eng. in Working Order]

Cost per lb. Light............. "
[Cost E. & T. by Light Weight Engine]

Cost per lb. Engine and Tender Light .... "
[Cost E. & T. by Light Weight E. & T.]

Cost of Engine, Light $...or...c. per lb.

" Tender, . " $...or...c. per lb.

Fig. 5.—Final Cost Summary Card.

ACCURATE BORING FOR LARGE DIAMETERS.

By Fred Newell.

In boring large holes or cylinders where accuracy is an important feature, such as for press and shrink fits, etc., or indeed in any case where one has to bore to a pin gauge, I believe the following diagram will be of practical value in providing an easy method of determining the required size of bore. It is well known that if one uses a pin-gauge of the exact size of bore required, that it is impossible to make a trial until the bore is at least the correct size, and most often one finds that he is just a little over size and has to reduce the finishing cut after entry, making a bell-mouthed bore, to say the least of it, not a very creditable job.

It is for this reason that many shops make a practice of using a pin gauge, a definite size too short and giving it a calculated amount of travel. These calculations require an amount of accuracy and time which can be better utilized in other directions by those in charge of the machine shop, or tool room, and by the use of this diagram one can be more certain of arriving at correct results than when a separate calculation has to be made each time.

On the horizontal axis of the diagram can be read off the travel of the gauge "T" opposite to the required diameter "D" and on the vertical axis, the necessary amount "D-L" the corresponding pin gauge is to be made short of the finished diameter.

If these gauges are to be stored for future use, it is a good plain to have them marked with the size of bore they will give and the amount of travel; should they require to be checked over at any time, their exact length can easily be found from the diagram.

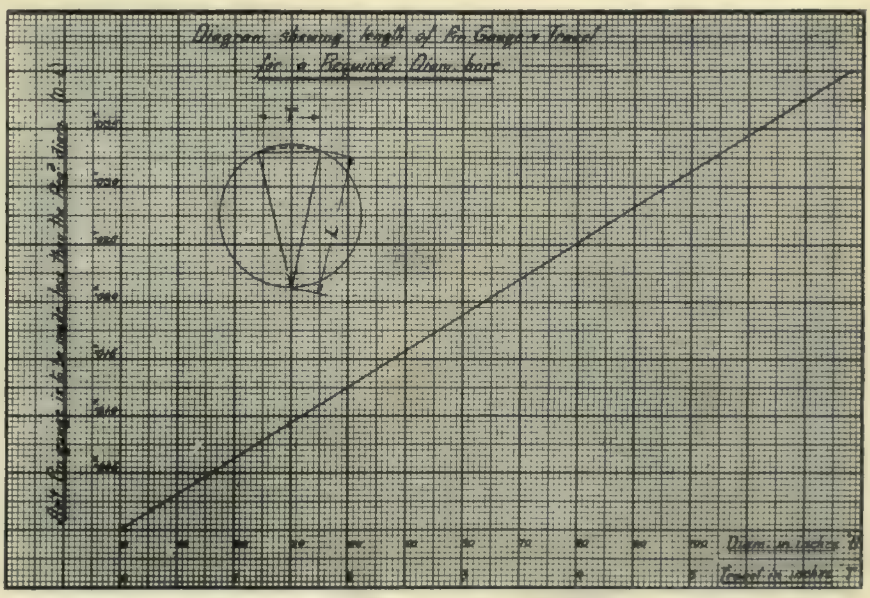


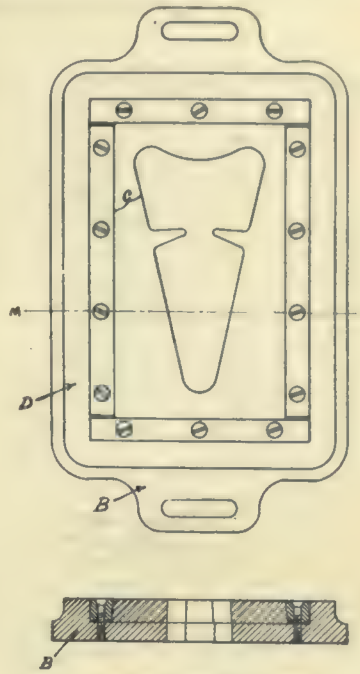
Diagram Showing Length of Pin Gauge and Travel. The Vertical Length Shows the Amount that Pin is to be made Smaller than Required Diameter.

A. S. McAllister, Secretary of the Point St. Charles Railway Y.M.C.A., has been transferred to a similar position at Kenora, Ont.

REPAIRING BLANKING DIE.

By J. H. Rogers.

The accompanying sketch shows the way that a broken blanking die was repaired to avoid making a new die.



Repairing Blanking Die.

The bed, B, was cast with the raised boss, D; the four inner surfaces were shaped out square, and the four sides of the die were ground with a slight bevel as shown in section cut. Four strips were closely fitted between the die and the four sides of the boss, D, allowing a little draw. When the screws were tightened the die was securely fastened, thus giving the die no chance to open at the crack, C.

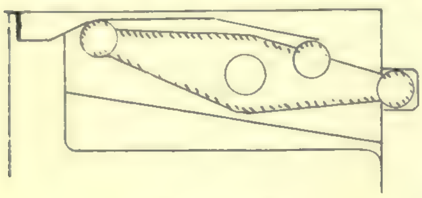
MACHINE SHOP METHODS AND DEVICES

Unique Ways of Doing Things in the Machine Shop. Readers' Opinions Concerning Shop Practice. Data for Machinists. Contributions paid for.

AUTOMATIC UNDERCUTTING TOOL.

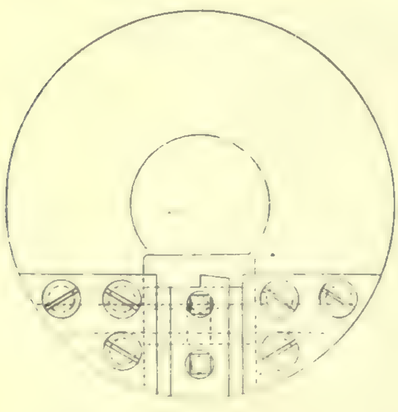
By W. Petessen.

The tool shown in sketch was designed for the purpose of cutting a clearance for the thread, under the shoulder of a brass plug, and has been used with good results on a Prentice automatic chucking lathe. It can, however, also



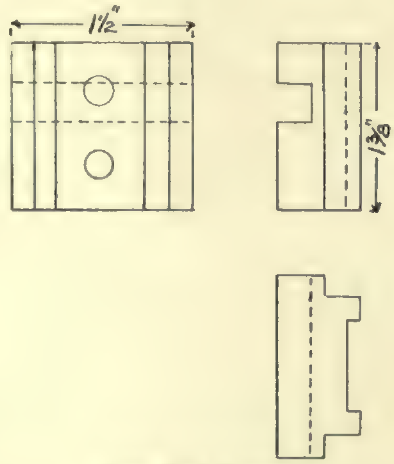
The Lever Arm.

be put to good use on any machine, where it is necessary to have the tool mounted on a revolving spindle, and to hold the work stationary in a vise, as for instance on a drillpress or screwing machine. The work or the tool may then be fed forward, and this motion is utilized to advance the cutter into the work.



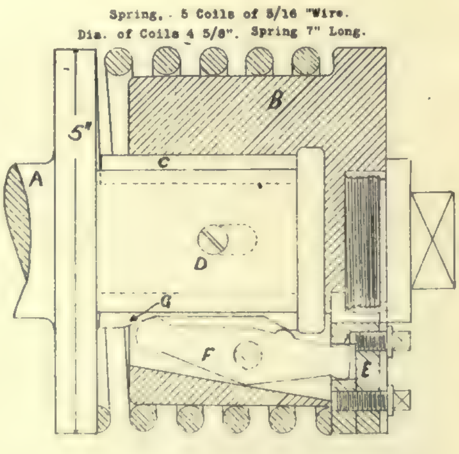
The main feature of the tool consists of the spindle A, which is chucked in the machine. On this spindle a sleeve, B, has been mounted, and keyed by the feather C, leaving it a sliding fit. A movement of 7-16 is secured by the slot in the sleeve, and the screw which enters the spindle at D. The coiled spring always keeps the tool extended when it is not engaged with the work. A small toolslide E has been mounted on the face of sleeve B, which is controlled in its movements by lever F which is part of the feeding mechanism.

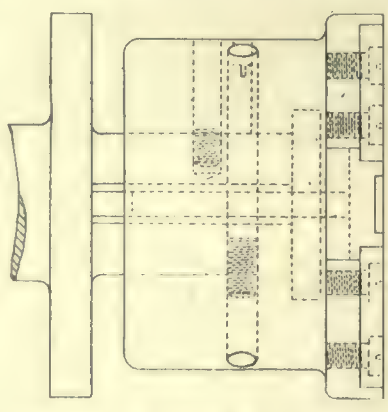
The operation of the tool is as follows: The plug to be machined is fed forward through the usual motion of the machine in use, and when the end of it comes in contact with sleeve B, it



Steel Tool Holder.

causes the latter to slide back on the spindle and in doing so the lever F mounts the taper incline on the feeding key G, thus moving toolslide E





End View, Section and Plan with Spring Removed.

towards the centre, and cutting the groove to the required depth.

In order to prevent the tool from digging in, and also to insure that it is promptly withdrawn before contact between the tool and plug cases, on the backward stroke, the feeding key and lever are both provided with two projections and it is easily seen that the toolslide is always under positive control. This tool does not admit of a large range of diameters, but it can of course be made up to suit any size required, and it possesses the advantage that there is not any elaborate setting required as it can be taken out of the machine and reset in a few minutes.

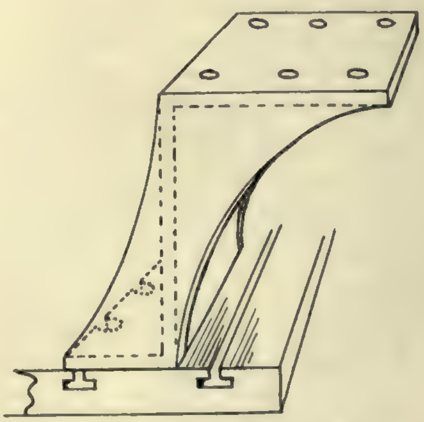
DOUBLE ANGLE PLATE.

By Mac. K.

On several occasions I have had longer work than a radial drill table would accommodate. In order to overcome the difficulty I devised a double angle plate which I have found very serviceable.

The accompanying illustration shows the double angle plate bolted to the drill base. This shows it bolted at the second slot of the drill base, but for handling work longer than the radial drill table it is bolted in the first slot.

It is planed the same height as the



Double Angle Plate for Radial Drill.

table is from the drill base. The ones I am using are 18 inches high with top plate 12x15 inches. The base plate is 6x12 inches slotted for bolts. The angle plate is made ⅞ inch thick with ⅞ inch ribs on both sides.

DEVELOPMENTS IN MACHINERY

New Machinery for Machine Shop, Foundry, Pattern Shop, Planing Mill; New Engines, Boilers, Electrical Machinery, Transmission Devices.

LONDON MACHINE TOOL CO.'S BORING MILL.

The boring mill illustrated herewith was built especially for the Otis-Fensom Elevator Co., Hamilton. It is a 60-inch mill with three heads designed for the rapid turning, grooving and boring of elevator drums. The mill is now in use at the Hamilton works of the Otis-Fensom Company and is giving very satisfactory results.

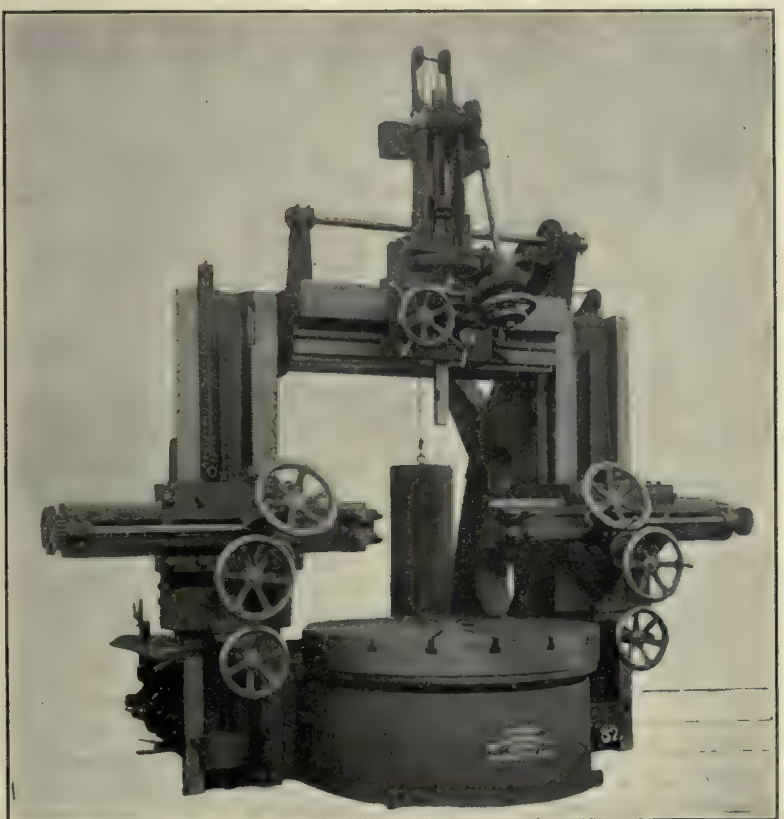
The mill has three heads, each head being controlled by an instantaneous gear changing device by means of which speeds ranging from seven-sixteenths to one and seven-eights can be cut. By throwing a lever the same mechanism gives turning speeds of .0625 to .266.

The boring head is on the cross-rail. It is operated by a separate motor. The turning motors are on the standdards. Both boring and turning motors are equipped with electric brakes, the design of the Otis-Fensom Elevator Company. The motors are also manufactured by the Otis-Fensom Elevator Company.

The machining of the drums is accomplished in one setting and the drums are machined in much less time than formerly. The boring mill is massive and weighs 35,000 lbs.

The side heads weigh approximately 3,000 lbs. each, but can be operated by hand with great ease. The control of the boring mill is convenient to the operator. The gearing is very heavy and made of steel.

The boring mill is manufactured by The London Machine Tool Company, Hamilton.



London Machine Tool Co's. Boring Mill Installed in the Works of the Otis-Fenson Elevator Co.

BULLARD SUPPLEMENTARY TURRET.

The Bullard Machine Co. have placed on the market a new device to facilitate the handling of tools on their vertical boring mills. It consists of a turret tool holder instead of the regular tool head and fits in the tool head in place of it. Fig. 1 illustrates the method of holding, the lever drawing the tool head solidly up against the slide by means of an eccentric and locking it in its correct position by a long contact between bevel shoulders on both the tool head and slide, at the back. The locking of the cam is adjusted by the long bolt at the top so as to always insure the supplementary turret being properly locked.

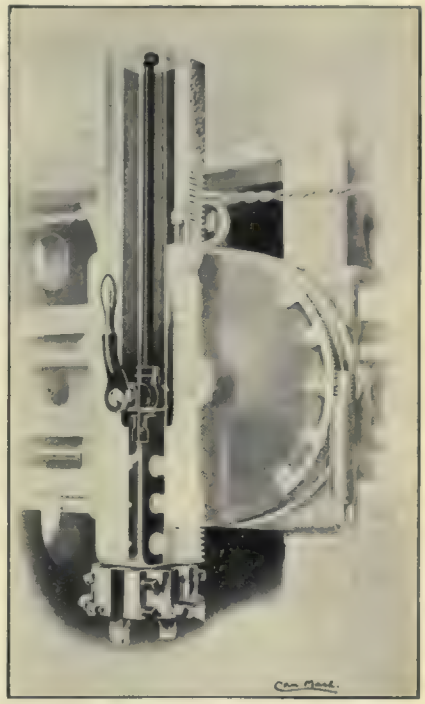


Fig. 1.—The Bullard Supplementary Turret.

This method has many advantages. After a roughing cut is taken, the handle is loosened, the turret turned to bring the finishing tool into place, the turret locked, the head adjusted, and the next cut is taken. Without taking out a tool, the boring and facing tools are brought into position one after the

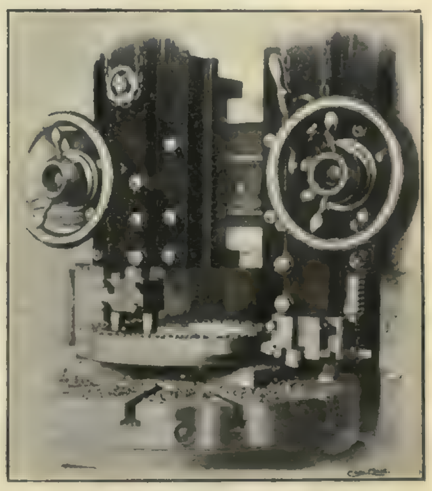
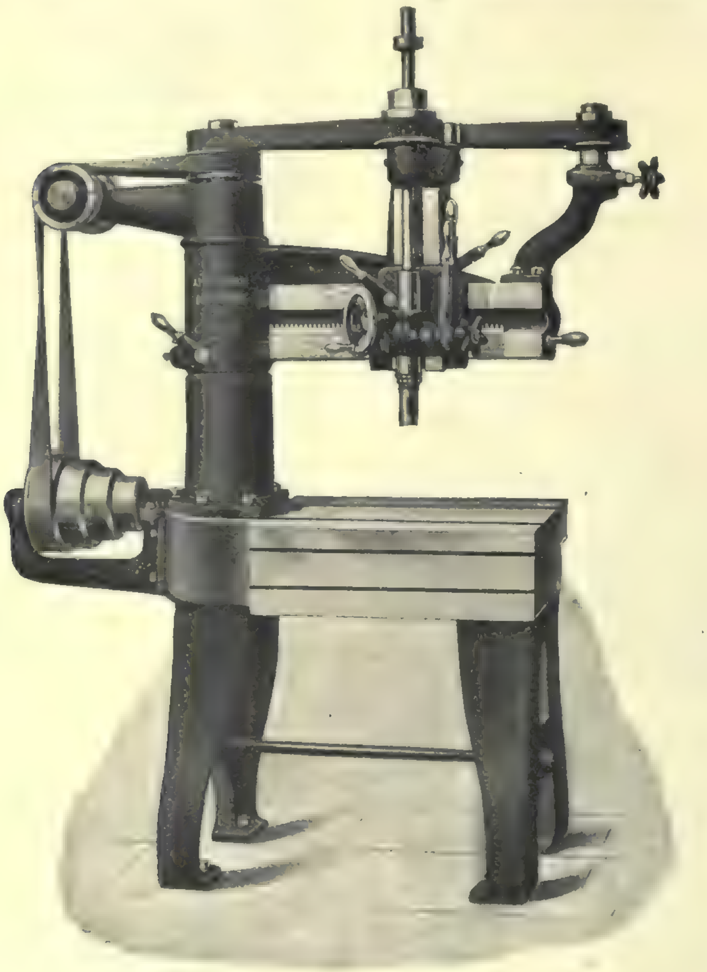


Fig. 2.—Two Turrets in Use.

other and the time saved is more than might be imagined unless it is realized that in many cases the setting of tools takes a third of the total time of manufacture.

Fig. 2 illustrates the use of supplementary turrets in both heads with eight tools in readiness for various cuts. The supplementary turret can be applied to boring mills now in use and does not interfere with the use of the mill in the regular way or any other tool. The supplementary turrets are made by the Bullard Machine Tool Co., Bridgeport, Conn.



High Speed Sensitive Radial Drill.

HIGH-SPEED SENSITIVE RADIAL DRILL.

This is the pioneer of radial sensitive drills and is designed by the American Tool Works Co., Cincinnati. The drill shown is a 2 ft. machine but it will also be built with a 3 ft. arm. Tapping attachments may be used with either of these machines.

The general design is such as to greatly simplify operation of the machine. All levers are directly at the operator's hand, and the movement of the head and arm, in locating same for drilling, is most easily and quickly accomplished.

There are no gears in the driving mechanism of this drill from the countershaft through to the main spindle, it being driven by means of a 2 in. double belt running at a high rate of speed, thus transmitting an abundance of power and speed direct to the spindle of the drill. The spindle belt is kept at proper tension by turning the star knob shown at the top.

All the driving and idler pulleys are equipped with ball bearings, which consist of a double set of hardened and ground ball races and cones, one set being located at each end of the pulley journals.

The spindle is of high carbon crucible steel, accurately ground and provided with a dust proof self-lubricating ball thrust bearing. Has six changes of speed, ranging from 300 to 900 r.p.m. in geometrical progression, obtainable through a 2-speed countershaft and 3-step cone pulley, regularly furnished. Is provided at the top with an adjustable stop collar, which may be used as a depth gauge. Spindle is fed by a long hand lever on ratchet wheel, the latch handle being self-releasing when in the uppermost position. A convenient star wheel supplies quick return to the spindle.

The head is of special design and is moved rapidly along the arm by hand wheel through angular rack, and spiral pinion, and may be clamped at any point along the arm by the lever shown at the right of head. Head consists of the main saddle which slides upon the arm and carries an auxiliary sliding head upon a vertical dovetail. This allows a vertical movement to the head thereby covering the full range of work between the table and the arm.

WALKER TOOL ROOM GRINDER.

Illustrated herewith is the latest form of the Walker Tool Room Grinder, called the No. 2 Outfit "K" which has several important improvements over previous forms of this machine.

As seen from the illustration, the machine has a substantial column, to which are attached tool cupboards and upon which is mounted the sliding carriage, having transverse movement on V tracks, and so designed that there is an absence of overhang at each point of the cross feed stroke. The machine has automatic cross feed at each end of the stroke by means of an adjustable crank disc, plainly shown in the cut, which operates a double acting ratchet, thus providing cross feed in both directions. Automatic longitudinal feed is obtained by means of worm and worm gear, running in oil in the gear box shown at the left, the worm shaft having bronzed bushed bearings and a two step pulley belted from a small counter attached to a carriage in the rear (not shown).

The most notable feature of this machine, however, is the unique and novel grinding head and improved belt drive. All the angular adjustments are in the grinder head, which is capable of being horizontally swivelled 180 degrees and the spindle of which can be vertically swivelled 45 degrees, and at the same time the grinding wheel can be raised or lowered in any of its angular positions without varying the tension of the belt. It will thus be seen that it is not necessary to employ any of the insecure devices for clamping heavy cutters in angular positions, that the cutter can remain securely fastened in a horizontal position, and that clearance is obtained by setting the wheel at the desired angle. These machines have been made for some time with a vertically tilting spindle, but recent improvements in this are shown in the outline cuts.

Fig. 2 shows a vertical cross section through the wheel post and housing, and the grinding spindle ; Fig. 3 is a similar view to Fig. 2, with the grinding spindle vertically tilted ; Fig. 4 is a ground plan of Fig. 8 ; Fig. 5 is the

Fig. 1.—General View of the Walker Tool Room Grinder, the New Belt Drive of which is Fully Described and Illustrated in this Issue.

same view as Fig. 3, with the wheel post B and grinding spindle D swivelled 90 degrees horizontally; Fig. 6 is a view of the left hand side of Fig. 5. Fig. 7 is a diagram view showing Fig. 6 swivelled 180 degrees. Here it will be noted that the driving belt has traveled to the opposite end of the drum A.

The post B has vertical adjustment, but does not swivel in its housing, the housing having a swivelling adjustment on the line XY, which practically coincides with the down leading side of the spindle belt, so that when the housing is swivelled as in Fig. 4 the belt will run in quarter turn. This belt in leading to the spindle pulley D passes first around the idler E, thence to the spindle and out again and around the idler G and down to the idler H, whence it returns to the drum A. It will thus be seen that a horizontal loop is formed in the leading side of the belt, which provides for vertical adjustment without change of belt tension, and also that when the spindle is tilted its axis passes between the idlers E and G, and the belt will simply run in a twist. It is, however, necessary, in order to prevent the crowding of the belt on the flanges of the idler E, to arrange this idler in a swivel bracket, so that its central plane of rotation will be toward the center of the rim of the spindle pulley D. This is plainly shown in the plan view, Fig. 4.

This grinder is manufactured by the Walker Grinder Co., Worcester, Mass.

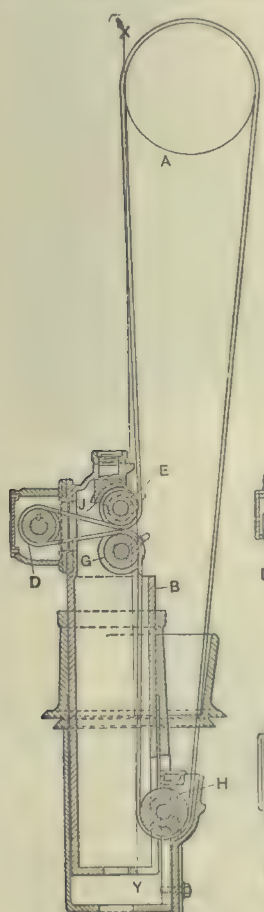


FIG. 2

FIG. 3

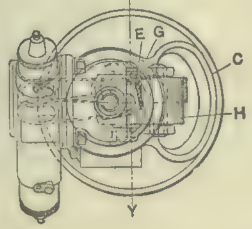


FIG. 4

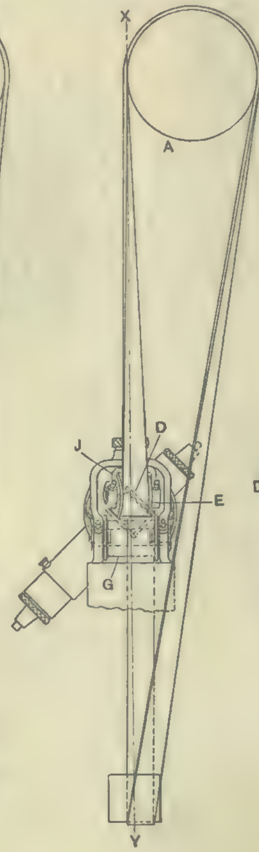


FIG. 5

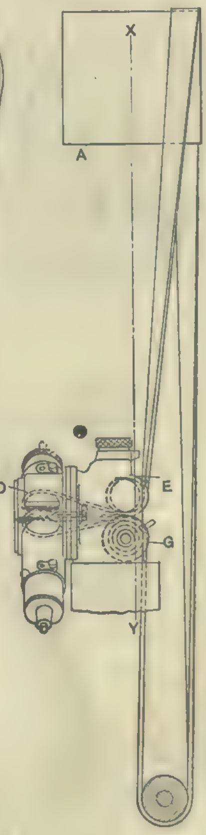


FIG. 6

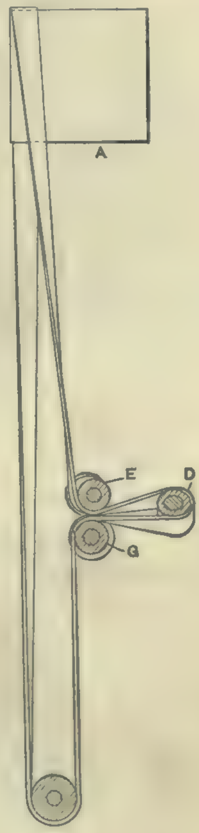


FIG. 7

POWER GENERATION AND APPLICATION

For Manufacturers. Cost and Efficiency Articles Rather Than Technical.
Steam Power Plants; Hydro Electric Development; Producer Gas, Etc.

VALVE-INSERTING MACHINE.

The old adage that "Necessity is the mother of invention" is as true to-day as ever, and has been proved anew in the instance of the Hoefer valve-inserting machine, the necessity of which was suggested by a water works superintendent, who felt the need of replacing some old valves in his water works system, as well as placing new valves.

This new machine with a simple, special valve as shown in cuts Figs. 1, 2, 3 and 4, furnishes a very reliable way of overcoming the difficulties of installing a valve and does it without shutting off the water.

The comparatively low cost of this machine brings it within the reach of any water works plant, where the shutting off of water from the customer is a great annoyance, and where danger from fire is great when water is shut off for the making of a cut to insert a valve, and the further necessity of installing new hydrants, or replacing the old ordinary, double nozzle hydrants with hydrants with steamer nozzles. This simple machine will appeal to the water works fraternity.

Construction and Operation.

The object of this machine is to provide means for inserting valves into a pipe under pressure, and with a minimum interruption of the flow through the pipe.

The embodiment of this new device of inserting a valve into a pipe, comprises a sectional valve casing, which is permanently secured upon the pipe at the point where the valve is to be inserted. This casing consists of two sections, which are secured together fluid tight by means of bolts, and the ordinary casing are permanently secured upon the pipe and the saw casing with the saw mechanism temporarily secured to the open side of the valve, the saws are then properly set with the blades equally distant from the valve seats and operated until the blades have cut a seat into the pipe, insuring a proper start for the blade; but before the cut is made through the wall of the pipe, the dome carrying the valve gates and stem is permanently bolted on the top of the two sections of the valve casing as shown in Figs. 2, 3 and 4.

Fig. 1.—First Operation, Valve Inserting Machine.

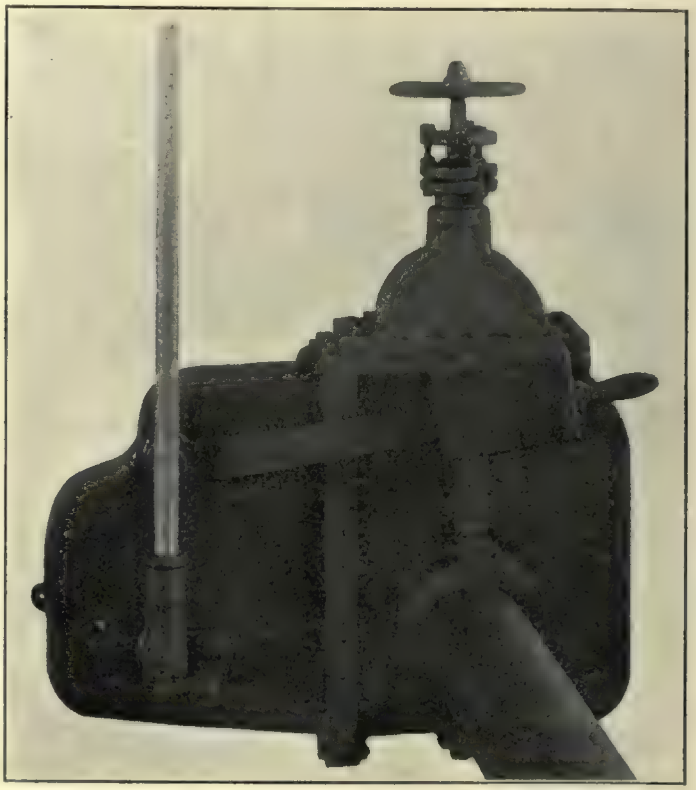


Fig. 2.—Second Operation, Valve Inserting Machine.

valve dome carrying the valve mechanism. The two sections have semi-cylindrical flanges to embrace the pipe. A fluid tight connection between the casing and the pipe is obtained in the usual manner, with a lead caulked joint.

The pipe cutting mechanism is carried by a casing shown in Figs. 1, 2 and 3 which is temporarily attached to an open side of the valve casing in a fluid tight manner by bolts, so as to enclose the pipe cutting mechanism in the valve casing.

After the two sections of the valve

The pipe cutting mechanism consists of two parallel saw frames connected together by cross pieces. To these saw frames are attached metal saw blades especially made for this purpose. The means for obtaining the reciprocating motion of the saws consists of a rocking shaft supported in stuffing boxes in the walls of the saw casing.

On this shaft is keyed a crank arm to which the saw frames are connected by means of a link. On this same shaft extended through the stuffing box, is attached a lever by means of which the saws are given the recipro-

cating motion, and are fed through the pipe by means of an outside adjustable weight which transmits its pressure to the saw blades, through a shaft and arm, to which a roller is attached bearing upon the saw frame.

When the section of the pipe between the valve seats is cut off, it is withdrawn into the casing of the machine by swinging the operating lever downward as shown in cut Fig. 3.

As the saws cut through the pipe, the valve casing including saw casing fills with water. When the section has been cut out of the pipe and drawn into the saw casing, the gates of the vaive are then screwed down onto their seats thus shutting off the flow through the pipe. The valve and saw casings having been drained by opening the pet cock provided for this purpose; the water may thus be caught in a vessel and prevented from running into the trench to the great annoyance of the workmen. The saw casing with the mechanism is removed from the valve casing and a plate forming part of the valve casing is permanently bolted to the open side of the valve casing as illustrated in Fig. 4. It will be observed that the flow through the pipe is interrupted only while the machine is being removed and the plate substituted, an operation which consumes but a very few minutes.

The valve mechanism is of the common double-gate expansible valve construction of a well-known type, manufactured by the Ludlow Valve Mfg. Co., Troy, N.Y.

This machine is not only useful for the insertion of valves, but can also be used in every day shop work, where it is necessary to cut pipe, in which case, one saw blade may be taken out and special pipe holders attached to the machine.

The valve-inserting machine is designed and manufactured by the Hoefer Mfg. Company, Freeport, Ill.

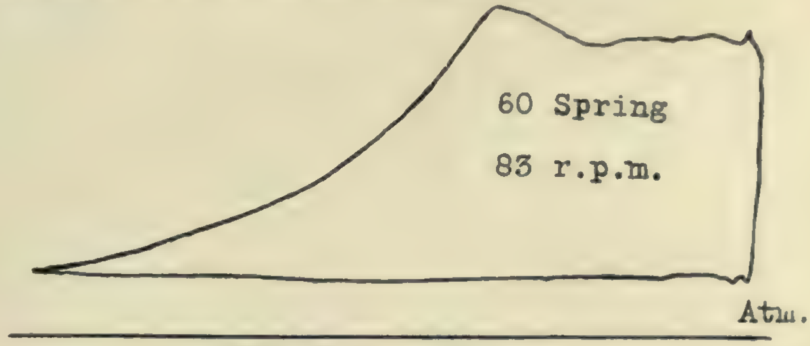


Fig. 1.—High Pressure, Compressing.

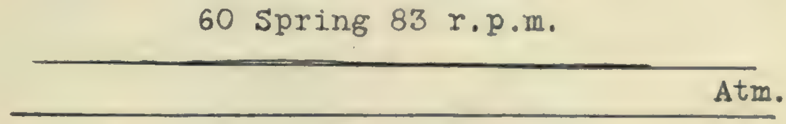


Fig. 2.—High Pressure, Unloaded.

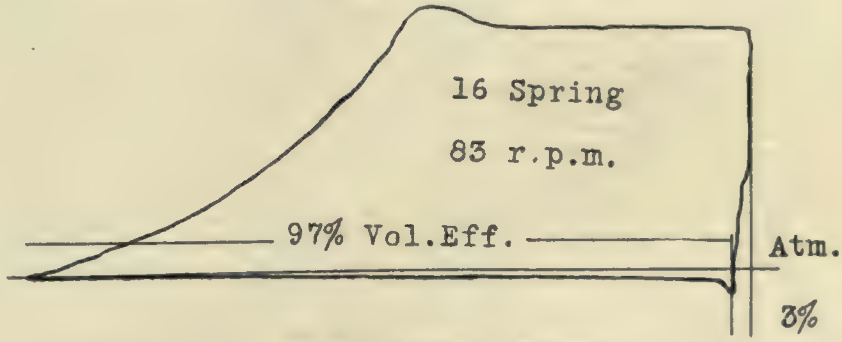


Fig. 3.—Low Pressure, Compressing.

Fig. 3.—Third Operation, Valve Inserting Machine.

Fig. 4.—Complete Valve.

VARIABLE VOLUME AIR COMPRESSOR.

By H. V. Haight*

The accompanying cuts are from the rope driven air compressor built by the Canadian Rand Co., Ltd., for the British Columbia Copper Co., and described on pages 37, 38 and 39 of the May, 1908, issue of Canadian Machinery.

This machine is a 25x16x36 duplex-tandem air compressor, having a capacity of 3474 cubic feet, and driven by a 600 horse-power motor by means of a rope drive. The special feature of the machine is the unloading device by which one-quarter of the load is thrown off at a time, by holding open one high-pressure Corliss inlet valve and one low-pressure Corliss inlet valve at each step. In reality the low-pressure Corliss valve is held open slightly before its corresponding high-pressure valve. This makes the unloading and the taking up of the load again come in practically eight steps and allows a little drop in the intercooler pressure between the four regular steps. This is well shown in Fig. 5 where the low-pressure cylinder is taking up its load.

These cards show almost perfect valve action both when compressing and when running unloaded. Further evidence of the very complete unloading of the machine is shown by the fact that the starting current, required for the alternating motor which runs the machine, does not exceed the full-load current. The completeness of the unloading as well as the very small friction of the motor, rope drive and compressor is also shown by the fact that the machine will run six minutes after the current is cut off.

The action of the unloader in maintaining steady air pressure is shown by the recording-gage diagram, Fig. 6. It will be seen that the machine is shut down from noon to 1 p.m., from 6 to 7 p.m. and also from 1 a.m. to 7 a.m. From 1 p.m. to 6 p.m. the machine is often overloaded, probably on account of opening up an air pipe to blow away the smoke from blasting. Except when overloaded or shut down the pressure is maintained at 97 to 100 pounds; the maximum variation does not exceed three pounds.

*Chief Engineer, Canadian Rand Co.

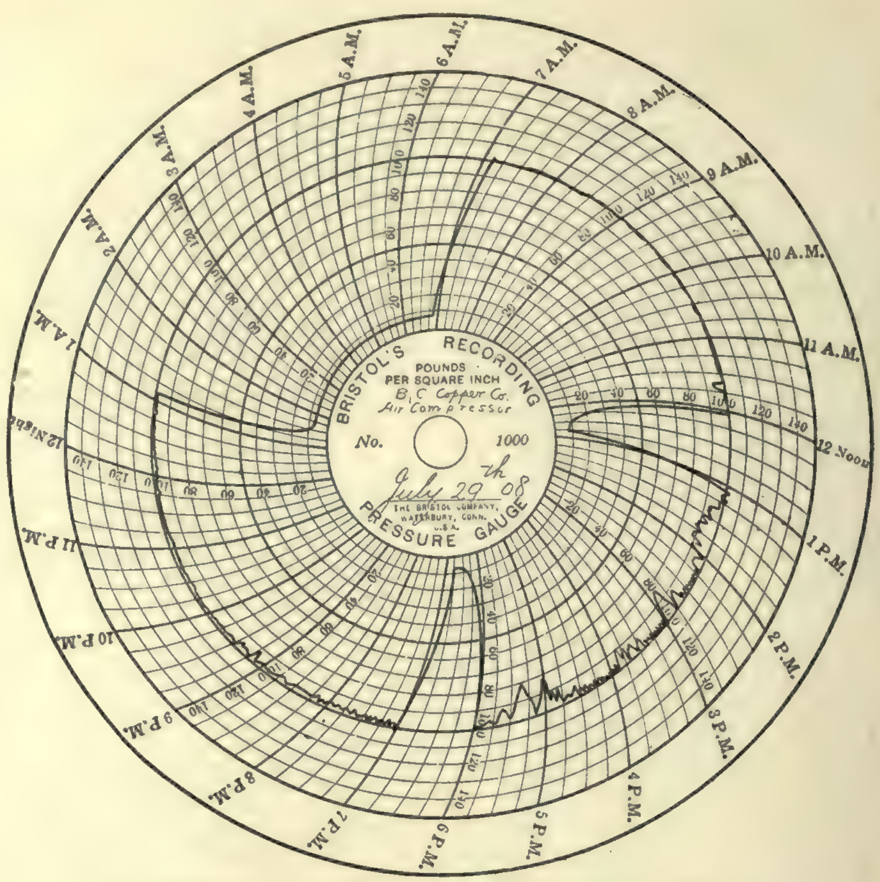


Fig. 6.—Pressure Gauge Record for Variable Volume Air Compressor.

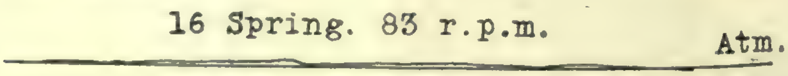


Fig. 4.—Low Pressure, Unloaded.

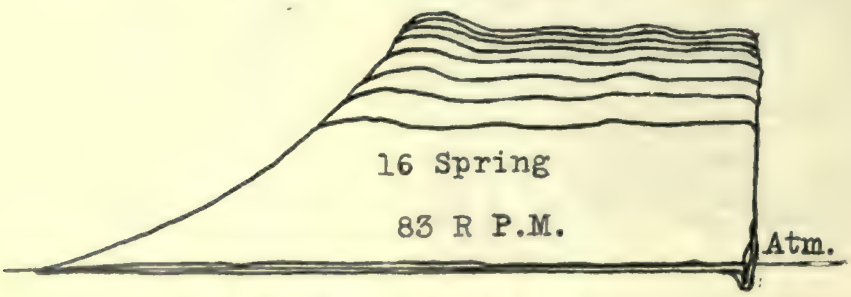
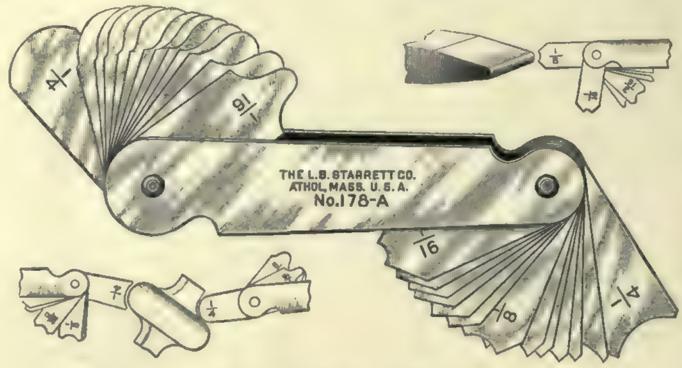


Fig. 5.—Low Pressure, Picking up Load.

FILLET OR RADIAL GAUGE.

This gauge is referred to as a Concave and Convex Gauge and is especially adapted for use in laying out special forming tools, dies, etc., as well as for measuring fillets. The illustrations show a few of the ways in which the gauge can be used. It is for the use of machinists and tool makers as well as pattern makers.



Fillet or Radius Gauge.

Size A has 26 leaves stamped to indicate radii by 64ths, from 1-16 in. to 1-4 in. (one-half diametric size). Diameters are from 1-8 in. to ½ in., varying by 32nds.

Size B is made with 32 leaves stamped to indicate radii by 64ths, from 17-64 in. to ½ in. Diameters are from 17-32 in. to 1 in., varying by 32nds.

They are being placed on the market by the L. S. Starrett Co., Athol, Mass.

CANADIAN MACHINERY AND MANUFACTURING NEWS

A monthly newspaper devoted to machinery and manufacturing interests mechanical and electrical trades, the foundry, technical progress, construction and improvement, and to all users of power developed from steam, gas, electricity, compressed air and water in Canada.

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Vol. V. APRIL, 1909 **No. 4**

ABOUT OURSELVES.

Canadian Machinery is accepted as a positive factor in the machine shop and foundry fields, and in technical education. That our efforts have been appreciated is without a doubt. The list of subscribers is growing steadily and there has been a constant demand for back numbers containing articles on cost-keeping and apprenticeship systems.

This demand has been so great, that, although we printed extra copies of the March issue, our supply has been exhausted. A late order came in from Montreal for two hundred copies, which, unfortunately, we were unable to fill.

About 1,100 extra copies of the April issue are being printed. The article on the Stratford shops is one of the leading features. Other articles are on cost-keeping, foundry practice, etc.

Our editorial ideals have grown with the paper, and though we have made great strides, we have been unable to overtake them. We have plans made for some articles to appear in future which will be of great interest. These include some up-to-date cost systems, articles on grinding, machine work and foundry practice. We are making careful selections and have secured articles from some well-known contributors. Among them is an article on Multiple Core Molds, by H. J. McCaslin. It is practical and interesting and will be one of the features of the May issue, which will be a special convention number.

The American Foundrymen's Association, and allied associations, meet in Cincinnati the week of May 17. Our pre-convention number will contain full particulars in regard to the convention.

Naturally the manner of treating subjects changes with the development of the paper. Your suggestions and criticisms will aid us materially to reach the end towards which we are striving, to give readers matter best fitted to their needs. We spare no expense to get good material. Our editorial columns contain a fund of information for manufacturers, superintendents, foremen, mechanics and foundrymen. Subscriptions continue to come in from all over Canada and our representatives in the different provinces are meeting with excellent results. With the co-operation of our readers and advertisers we will make Canadian Machinery a still greater credit, not only to ourselves, but to the profession and business we are endeavoring to assist.

JAPANESE TRADE POSSIBILITIES.

W. T. R. Preston, Canadian Trade Commissioner to Japan, gives some interesting data in regard to Japanese conditions. There are possibilities of Canadian manufacturers enlarging their exports by catering to Japanese trade. We take the following extracts from Mr. Preston's report:

Mica is being imported from Korea, India, Germany, United States and Great Britain. The importation of mica in the last three years has increased from $7,000 to $60,000. With the steady development of the electrical industry in Japan, there is little doubt that the importations will increase considerably. This fact should be decidedly interesting to exporters of Canadian mica.

The following table shows the amount of mica exported from Canada:

Exported to—	Quantity, lbs.
Great Britain	245,988
United States	643,571
Others	21,143

By comparing the figures in the above table with the importations of mica into Japan, it will be seen that about 80 per cent. of the export of Canadian mica goes to the United States, while the proportion of mica coming to Japan from the United States is 62 per cent. of the total import.

From an examination of the imported United States product, it almost leads to the conclusion that not a little of this is Canadian mineral. The same condition exists with lead. Iit is learned from what seems to be absolutely reliable authority, that a considerable portion of this material imported to Japan from the United States is actually Canadian product.

The increased demand for steam engines and boilers and other forms of motor power furnishes an insight into the development of industrial life of Japan. The importation of these classes of machinery was not much more than 200,000 yen ($100,000) in the year preceding the China war, and has now reached within measurable distance of three million yen annually ($1,500,000).

It is also noticeable that there has been a steady increase in the use of motive power, while in the last 10 years the number worked by manual labor has not increased in so great a proportion.

Of the motive power used in this country, steam stands first, then electric, and the kerosene or gas engine is third on the list:

Total H.P. in factories	288,523
Steam H.P.	203,002
Dynamo H.P.	30,353
Motor H.P.	23,716

The ordinary small engine and boiler of about 50 h.p. or less is made in Japan. The larger ones, however, as well as a certain class of special small engines, are imported from Great Britain, United States, France and Germany, in the order named. The recent increase in the importation of machinery has, however, been mainly caused by the sudden expansion of cotton-spinning factories,

which took place immediately after the war with Russia. The orders for machinery to meet the expansion of this business will not all be delivered until towards the end of this year, so that there will not be any decrease in the value of the importation of machinery in 1908.

It is assumed that the number of steam engines used in the various industries in Japan at the end of 1906 was 55,400. A great number of these will be replaced in the near future by engines and boilers of greater power, as well as having to be replaced on account of becoming useless through wear and tear. The opportunities, therefore, for business are obvious.

The following statement gives the importation of turning lathes into Japan, during the last ten years:

	Yen.
1898	243,863
1899	331,070
1900	231,403
1901	709,105
1902	473.084
1903	178,109
1904	837,615
1905	3,349,617
1906	1,120,405
1907	1,014,560

Between 1905 and 1907, the percentage of this business with Great Britain increased from 35 to 75 per cent., while the corresponding percentage of the business with the United States has decreased from 56 to 21 per cent. Notwithstanding the development of the lathe manufacture in Japan, it is quite evident that the froeign product holds the market to a very large extent. The sudden increase of the importation was in consequence of the war. The demand in the navy and army arsenals and private factories for heavy lathes was exceedingly brisk, and the price for this machinery increased enormously. This condition of affairs gave an impetus to the importation of lathes from the United States on account of quick delivery from that country.

From this report the possibilities for increasing trade with Japan are obvious. Canadian manufacturers of certain lines have not been very keenly alive to foreign trade, and the report of Mr. Preston should encourage them to give more thought to trade expansion.

Manufactured iron and steel of all kinds will continue to be imported because the country cannot produce its own requirements. For naval and military purposes alone the importations are very large and will probably continue to increase.

Japan has only three producing iron mines and cannot supply her own requirements of iron ore and pig iron. The number of miners employed in the iron mines last year was only 477, and the amount produced was comparatively small. For the year 1908 the imports of iron and steel, pig and ingot, amounted to a little over 200,000,000 pounds, and of iron ore about 420,000,000 pounds.

THE AUTOMOBILE INDUSTRY.

A bill prohibiting the use of the automobile on certain days of the week has been presented to the Ontario Legislature. It is unfortunate that one province in Canada will not allow the use of an automobile within its boundaries and it would be a stain on the progressive spirit of Ontario, were this province to try and clog the wheels of progress by passing a law prohibiting the use of automobiles.

It is noticeable that farmers are the chief ones in the opposition to the automobile, yet it is an interesting fact that in parts of the United States the automobile has grown into such favor with the farmers that a horse is an exception. A view of a market day in one of the southern cities, showed a collection of automobiles from which framers were selling the products of the farm. Automobiles are also used as a motive power on farms, but not to a very great extent as yet.

We believe that in the possibility of any bill passing the Legislature, the farmer will be the first to ask that it be rescinded. When he realizes how he can use it for plowing, threshing, marketing, etc., he will adopt it for use on the farm.

The growth of the automobile industry has been a great stimulus to several lines of manufacture. The influence of the automobile trade is felt in the nut and bolt industry, in the manufacture of rubber hose, gas engines, packing, copper rivets, copper and brass tubing, jacks, automobile vises, open-end and other wrenches, spark plugs, dry cells, ball bearings, etc.

The advent of the automobile was responsible for great advances in the design and building of machine tools. The fine work required in the manufacture of the automobile parts and accessories made a better class of machine tools necessary and manufacturing industries, generally, have reaped the benefit. Let us not knock away the rungs of the ladder by which we have climbed.

THE FRENCH TREATY.

The French treaty will undoubtedly be of great benefit to Canada. Over 75 per cent. of the agricultural implements imported into France each year are manufactured in America. A duty of 20 per cent. is levied on this machinery, compared with 5 per cent, levied on machinery imported from European manufacturing firms.

By the French treaty Canada will enjoy the minimum tariff on a number of natural and manufactured goods, including wood, metals, grain, agricultural implements, etc. The treaty calls for a direct steamship service between the two countries. No transhipment of goods may be made, except where a country enjoys the privileges of the minimum tariff. That is, France may use the port of any third country enjoying the privileges of Canada's preferential or intermediate tariff, and Canada may tranship at the port of any third country enjoying the French minimum tariff. It is expected that the treaty will greatly stimulate the export of Canadian-made agricultural implements and finished products in iron and steel.

THE STEEL SITUATION.

The "open market" declaration of the United States Steel Corporation should do much to restore activity to the steel markets. Prices, before the decision of the steel magnates, were away too high for the dull trading conditions existing. No encouragement was being offered to business, and although the independents were shading to meet orders, they were not big enough to influence the situation. To a great extent the hands of the U. S. Steel Corporation was forced by the smaller fry, but it is also apparent that the big concerns wanted business, and saw that this was the only way to get it.

Of course, for the time being the steel markets are showing little improvement, as probable users are holding off in order to find out how low the markets will go. There has been no established price basis. Merchants are quoting on each individual order, but gradually certain prices are coming to be recognized as standard prices, and when the markets have thoroughly settled down at this level, so users will come in. There is plenty of business waiting to be attracted.

Although rumors as to drastic cutting going on have been very prevalent, it is evident that the leading interests

are not letting the markets get out of hand. This is the correct course to adopt. It was necessary for prices to be lower, but it was not necessary for the markets to be cut to pieces. Shapes, plates, bars, pipe, sheets, and tin plates have been affected, but wire products and standard rails have been left alone. So far as Canada is concerned, the steel magnates are making no concession. The cutting, they say, was for the States and not for export. The tendency, however, is for structural material to be cheaper, as importers generally will give their customers the benefits of whatever reduction they can get.

Generally building prospects will be greatly helped by the cut, and building, of course, plays a very important part in the prosperity of a country. All the way round business should be improved by the lower prices obtaining. The demand wants encouraging, and the best encouragement it can get is by a lowering of prices to suit conditions. When the finished lines become more active pig iron is bound to improve, and so the whole markets will benefit. Iron and steel are still the trade barometers, and with a rising movement in those markets, the whole metal situation would be strengthened.

USELESSNESS OF COAL DUTY.

There is a decided feeling among manufacturers that the duty on coal should be removed. In the west the United States must have British Columbia coal. During January the importations of Wellington coal into Seattle was between 10,000 and 12,000 tons. On every ton of this coal imported into United States territory duty of 67 cents a ton is paid.

"Had it not been for our heavy importations of coal from British Columbia," said Mr. Waterhouse, of Seattle, recently, "there would now be an acute fuel shortage in Seattle. We are putting out about 500 tons a day and you can see team after team leaving our bunkers while others are waiting."

The Canadian railroads alone pay over $1,000,000 each year for duty. In Ontario, where there is no coal and it must be imported, the costs of manufacturing are greatly increased by the imposing of a duty.

In Nova Scotia there is a tax on every ton of coal mined and this could probably be adjusted to help lessen the results of competition from United States coal. The removing of the duty will be of general benefit.

TELEPHONES IN INDUSTRIES.

We have noticed in several industrial establishments the telephone being used with great success between the offices of the superintendent and foremen of various departments. The use of the telephone is one of the steps in the evolution of an economical shop organization.

In the G.T.R. shops at Stratford, which are described in this issue, a telephone system is being established between all departments, stores, tool rooms, the several shops, offices, etc. The system to be followed is described in the article on the machine department. In many other Canadian shops it is used with great success and it is found that a telephone system saves the time of superintendent, foreman and mechanics.

As a time-saver the telephone is a useful instrument. Without it, forement lose time looking for foremen of other departments with whom they have business. During that time these foremen are not in their departments. The aim of shop managers should be to keep the foremen in their departments all the time and to see that mechanics lose no time getting tools, etc. This can be done by utilizing the telephone.

TOPICS OF THE MONTH.

Manufacturers should have the "open door" for travelers. As a rule, they cover a great deal of territory and are thoroughly acquainted with existing conditions in many parts of the country. Even if there are no orders for them, if manufacturers receive them courteously, they will receive valuable information that will repay them many times over for their lost time and make a friend among the traveling fraternity.

* * *

The increased Government revenue for January shows that trade is reaching normal in Canada. Figures of Canadian trade in February tell the same story. The total imports for home consumption were $23,125,380, an increase of $2,188,614, as compared with February, 1908.

* * *

Recently a doctor, a graduate of an Ontario university, was fined for practising in Ontario. The law does not prevent a graduate in mediciine going into the field of engineering work, however, and it seems a poor law that does not work both ways. Placing a medical man in charge of construction, laying concrete walks, putting down drains, etc., would be like sending an engineer to prescribe for typhoid or like placing a tailor in charge of a machine shop. The man may accomplish his work well, but it is poor advertising for the graduates in science of the university that puts the graduate in medicine in charge of buildings and grounds to look after repairs and construction.

* * *

Views of the C.P.R. Angus shops, Montreal, with the men at work, were shown by moving pictures, recently. Moving pictures could be used by the railroads for training apprentices, illustrating the methods of turning, boring, etc. For instance, pictures could be given of the different operations, setting cylinders in the boring mill, arranging tools for boring, etc. There are many cases where moving pictures could be used to advantage. After illustrating the methods at one centre for a time, the films could be passed on to the next. At present the scheme would be too expensive to be used by manufacturers generally, but would be a feasible one where the views could be used at a number of centres. In a national system of technical eduction, moving pictures can be made to play a very important part.

* * *

A movement has been on foot for several years among tap and die manufacturers to eliminate the use of the old V-thread for general commercial purposes. The great advantage of the U.S. from is such that manufacturers have decided to lend their influence towards a larger use of the U.S. standard.

Such firms as Pratt & Whitney, Dundas; Canadian Tap & Die Co., Galt, are of the opinion that eventually the V-thread will be eliminated and that all threads will be governed by the United States formula. All threads may not be made according to the U.S. standard as now adopted, but they will be of the same form. The tap and die manufacturers recommend the use of the U.S thread weherever possible, believing that this type gives every satisfaction. It will be more advantageous for both manufacturers and customers if the old V-thread is discontinued in shop practice. The V-thread is harder to make and less durable. Manufacturers are general in their opinion that it would be decidedly better to eliminate the old V-thread.

In this issue is an article which fully explains the proposal to adopt a standard form of thread. This should be read with interest by mechanical men generally.

FOUNDRY PRACTICE AND EQUIPMENT

Practical Articles for Canadian Foundrymen and Pattern Makers, and News of Foundrymen's and Allied Associations. Contributions Invited.

METAL MARKETS.

Although trade is not going ahead with any great rush the monthly aggregate volume of business is steadily improving. Orders keep on the light side, but on the other hand they are frequent, which makes up for the deficiency in bulk Inquiries have been very good this month, and it is evident that users are only waiting for a favorable opportunity to come more heavily into the market. Stocks are extremely low, and although this condition of affairs is all right so long as metals are easy, users are not anxious to be caught on a rapidly rising market with no stocks and a good consuming demand. So soon as the market shows signs of real stability and developing strength, so will users buy further ahead than they are doing at the present moment.

Despite good trade copper has been steadily dropping all the year, and with two cuts during the month the jobbing price is now around 14c. But for the weakness in the primary markets, it is probable that much better business would have developed but confidence in the metal has been shaken by the sagging of figures. The production of copper is going on at the same record speed, and a large amount of metal must now be held. It is certain that the pace cannot be maintained, and that if the larger producers do not stop the smaller ones must. The future of copper, unless a strong consuming call breaks in, demands such a course. Tin has been unaffected in price during the month, and remains around 31½c. Here again inquiries have been good, and a steady market would bring out a lot of business. The English market has been fluctuating owing to speculative influences, but on the whole figures have shown a firming tendency. Spelter sagged a little for one week, but soon recovered its tone, and is still marked at $5.50. Trade has been very good indeed, and with the English market in a firm state, favorable trade conditions seem likely to continue. Imported lead has weakened during the month, and is now marked at $3.65. Trade has been fair, but the English market has not been strong, and this has naturally affected the local price. Trail continues to be about 10c less.

The open market declaration by the United States Steel Corporation has caused a general readjustment of prices across the border, but it has not affected the Canadian market to any great extent. The American steel tonnage seems to have improved by the cut, but pig iron does not show signs of being greatly helped as yet. In fact, prices seem to be receding, while steel, after the first few days of cutting, is now on a much steadier basis. Canadian furnaces are reported to be still busy on fair sized orders, and are maintaining prices well. There is very little imported pig in store, and consumers will be very glad when the St. Lawrence opens.

THE A. F. A. CONVENTION.

Foundrymen and manufacturers of foundry supplies and equipment are already manifesting considerable interest in the convention which will be held in Cincinnati the week of May 17-22, and owing to the central location of the city it is estimated that the attendance will exceed that of any other meeting. It is sincerely hoped that there will be a large representation of Canadian foundrymen at this convention. President Lawrence L. Anthes, being a Canadian, should arouse a still greater interest in this convention among Canadian foundrymen.

The Cincinnati foundrymen have already organized and are making preparations for the reception and entertainment of the visitors. It has been practically decided to hold a general reception, probably at the Hotel Sinton, on Tuesday evening, which will be known as "get together night." On Thursday afternoon and evening a boat ride on the Ohio river has been planned to a Kentucky pleasure resort where a barbecue will be held.

A special meeting of the executive committee of the Foundry and Manufacturers' Supply Association was held at the Hotel Sinton, Cincinnati, for the purpose of making arrangements for the exhibit, which will be held in Music Hall. The following members were present: F. N. Perkins, president; Geo. H. Wadsworth, John Hill and E. J. Woodson, vice-presidents; J. S. McCormick, treasurer; C. E. Hoyt, secretary; Geo. R. Rayner, J. S. Smith, U. E. Kanaval and E. A. Pridmore. L. L. Anthes, president of the American Foundrymen's Association, and Dr. Richard Moldenke, secretary, met with the committee, and it was decided to charge an admission fee of 25 cents for a single attendance, and season tickets will be sold at the registration desk which will entitle visitors to attendance throughout the week at a cost of $1.

Considerable space has already been sold by the secretary, and the indications are that the number of individual exhibits will far exceed those at the Toronto convention.

The registration booth will be located in Music Hall, where the meetings of the American Foundrymen's Association, American Brass Founders' Association, and Associated Foundry Foremen will be held. The Hotel Sinton has been selected as headquarters for the members of the American Foundrymen's Association and the American Brass Founders' Assoication, while the headquarters of the Associated Foundry Foremen will be established at the Grand hotel.

DIE CASTINGS.

The H. H. Franklin Manufacturing Company of Syracuse, N.Y., has lately named the Special Machinery Manufacturing Company, Limited, of Montreal, as its sales agent for Canada in the handling of the Franklin die-castings.

The die-castings are made under pressure by a patented process. By this process the castings are turned out in a finished state. By this method it is frequently possible to cast as one piece machinery parts which if made by other methods would have to be cast in section and assembled. The process is especially adapted to the production of small, complicated parts. Every hole, slot, lug or large thread being perfectly formed at the time of casting,

The manufacturers of die-castings give a long list of mechanical contrivances in which the product is used. Some of them are: Talking machines, time recorders, soda fountain pumps, voting machines, piano players, automobile sundries, engine bearings, telephone apparatus, adding machines, vending machines and others of like sort.

Several alloys are used, the one most commonly utilized being known generally as Franklin Metal. The castings can be nickeled or brass plated, oxidized or japanned. The Franklin Metal is not intended to stand the strain when the toughness of wrought material or steel is required. Heavy work is not attempted.

Precautions to be Exercised in Treating Cast Iron *

A Paper Discussing the Properties of Cast Iron, Fracture, Shrinkage, Internal Strains, Physical Tests, Temperature of Pouring, Etc.

By SIDNEY G. SMITH

There is no branch of the art of molding that requires more care and skill than the making of cores (I do not mean plain cores), there being so many little details to watch, especially with large sand cores, that are almost inclosed in metal with very small outlets for venting. There has to be sufficient support in the cores to resist the pressure of the iron and also to be made secure in the mold with an abundance of internal ashes to relieve the generated and expanded gases until it can get clear away. If these provisions are not made a badly blown casting will be the result. The cores must be thoroughly dried, well vented, and sand refractory enough only to stand the thickness of iron that incloses them. If the sand is strong without sufficient opening material, trouble must be looked for.

Properties of Cast Iron.

Generally speaking the constituents of cast iron are as follows : Carbon in its two forms, combined, and graphite, silicon, manganese, phosphorus, sulphur, and possibly traces of other metals and metalloids. Perhaps with the exception of sulphur the other constituents are necessary for combining and uncombining the carbon, liquidizing, etc., and even sulphur may have some redeeming feature in chilled castings.

Effect of Metalloids.

The effects of the metalloids are : Combined carbon gives hardness and strength ; graphitic carbon softens and toughens ; silicon softens by its influence upon the carbon when that content is not in excess. It also promotes fluidity. Phosphorus also promotes fluidity, but if in excess causes brittleness. Sulphur hardens the iron, increases contraction and causes sulphur holes. Carbon and silicon are the two principal constituents that require control. The effect of different percentages of silicon in transverse and tensile strengths can be seen at a glance at Table 1 from a paper by W. G. Scott upon "Foundry Iron and Ferro-alloys."

As pure iron is useless and only exists as a curiosity, it is only in combination with other metals and metalloids that it becomes of practical use.

For many years, I think I may say for all time, we have made our mixtures by fracture, even on the pig beds where chemical analysis should commence the metal is classed generally by fracture. This method is now condemned as unreliable. But is it so unreliable ?

Appearance and Analysis.

It must be admitted that competent foundrymen in the past have not gone very far astray in selecting the metal by fracture and other tests which are not chemical, and to do so with good results, a knowledge of not only the appearance of Nos. 1, 2, 3 and 4 irons is needed, but of the districts where the iron is made. These numbers, representing different grades of iron from No. 1 soft, and open-grained, to No. 4 and so on to mottled and white, should show a different analysis chiefly

Per Cent Silicon		Transverse Strength Pounds	Tensile Strength Pounds
0.20	extremely hard	2,600	20,500
0.50	very hard	2,800	24,500
1.00	hard	3,000	25,500
1.40	medium hard	3,300	26,500
1.90	medium soft	2,900	31,500
2.20	soft	2,500	30,000
2.50	very soft	2,300	29,000
3.00	extremely soft	2,000	24,500
3.50	slightly hard	1,700	22,500

Table 1.—Influence of Silicon on Transverse and Tensile Strength.

in the state of the carbons, which are influenced by the content of silicon, manganese, phosphorus, and sulphur, and these in turn are influenced by the way the furnace is working, the burden, fuel and fluxes used.

I am aware that grades can be somewhat altered in appearance, but I refer now to the ordinary way of casting on the sand pig bed, not from chill pigs, or cooling by moisture. I have yet to find an open-grained No. 1 or 2 pig that is hard iron, or a mottled or white iron that is soft.

Selection of Scrap.

In selecting scrap there may be some uncertainty unless it is known where it comes from. The writer's plan has been, first to decide what was wanted; choose the grades and scrap which will suit the work in hand, and in many cases afterwards where the work is machined follow it up. Notice how the tool takes it, and if a clean finish, go to the water test where often something may be learned, also to the test-house and watch the deflection transverse and tensile strengths of the bars.

A few years of close observation plus aptitude enables a person to get the required mixture. In selecting the grades and scrap, allowance must always be made for the remelt, which will come from the cupola a little closer grained, and slightly harder than that selected, owing to the increased combined carbon which is caused by a reduced silicon and increased sulphur. If what I have said is substantially correct, I do not think it is such an impossible matter to judge and mix iron by fracture, providing it is known that the iron is suitable for any special class of work. That knowledge will only come by experience and close observation.

There is no doubt that mixing iron by analysis is the most scientific method when it is established that a given analysis will produce a mixture of iron that will be satisfactory for different classes of work. In general foundry work there are many matters to consider. A mixture of metal that would be suitable for a cylinder would be unsuitable for a large pulley, and so one may enumerate on the different kinds of work which require close and open grain, toughness and hardness, tensile and transverse strengths, also it must be remembered that different mixtures will vary in contraction, which in practice should be kept as near constant as possible.

Shrinkage and Crystallization.

Cast iron shrinks and draws during the period of solidification or crystallization. A bar 8 by 8 inches by 12 feet long will not contract so much as a bar 8 by ½ inch of the same length. There will be a difference. Why ? If the two bars be broken it will be noticed that the thin bar is a closer grain than the thick one owing to the crystalline structure in quickly cooling. So quickly will the thin bar cool that the carbons will not have time to separate, hence it will show a higher combined carbon. The thick bar will take much longer to solidify. The outside of the bar will cool first and will set even when the inside is in a molten condition. That being so, as the outsides become firm

*From a paper read before the Cleveland Institution of Engineers.

and hard the due contraction is prevented from taking place on the length of the bar. The inside of the bar when broken cold will show a more open grain because the carbons have a longer time to divide. Upon close examination it is possible to find a little openness and even sponginess, owing to the crystals being attracted to the part which cools first.

Weakness in Thick Sections.

Some years ago the writer when making round-ribbed plates 9 feet in diameter in hematite iron, the web was 1 inch thick, the ribs which crossed and recrossed being rather thicker than the web. The ribs did not reach the outside diameter of the plate by some 9 inches, then tapered from that to 6 inches deep in the center, evidently all the strength was required there. What happened? From the outside diameter where the ribs did not reach were one or more cracks which went into the web some two or three inches. This was caused by the setting of the outside of the plates first, then the powerful contraction and pull coming later from the ribbed part of the plate as it cooled caused the thinner part, although set, to give way. I know it is often difficult to have uniform thickness, but it should be borne in mind that thick sections close to thin sections are often a source of weakness rather than of strength.

Iron when changing from the liquid to the solid state is said to become a mass of crystals which assume different forms regulated by the time the castings take to cool, and the temperature of the iron when poured into the mold. The lines of crystallization depend upon the direction in which the heat passes off fastest. It would be very difficult for a foundryman if he understood the law of crystallization to cause the crystals to radiate in lines that would strengthen the weak parts.

Formation of Shot Cavities.

Mr. Stead in his lecture upon iron, sulphur and phosphorus, mentioned globules of metal found in blowholes of castings with the analysis of same. I have many times seen the same thing and watched the tool jump over the places. These shot cavities are mostly found near the top of castings and seldom the bottom (I mean the top as the casting is poured). Mr. Stead explains the separation and formation of these hard shots as far as it is known.

My experience with regard to shot cavities is that they are mostly developed in iron which is rather hard. They are seldom found in a soft tough iron. The harder the iron the greater its tendency to be irritable when poured into a mold. The analysis quoted by Mr. Stead from Mr. Munnoch is as follows:

	Castings P.C.	Shot Globule P.C.
Combined carbon	0.62	2.20
Graphite carbon	2.74	Nil
Manganese	0.51	0.63
Silicon	1.63	0.70
Sulphur	0.09	0.03
Phosphorus	0.88	5.68

The analysis of the casting would indicate by no means a very hard or very soft iron, the content of phosphorus being 0.88. In the shot, that content is 5.60. What is the explanation of extra 5 per cent. nearly, of phosphorus? Silicon is down to 0.70 from 1.63, and no graphitic carbon, the total carbon being lowered from 3.36 to 2.20. This is a most important matter, and it would be a great advantage to the foundryman if the true cause of the phenomena could be discovered.

Shot cavities and hard spots in iron cause a great amount of trouble in the machine-shop, apart from unpleasant complaints to the foundry foreman.

	Light	Medium	Heavy
Silica	82.21	85.85	88.40
Alumina	9.48	8.27	6.30
Iron oxide	4.25	2.32	2.00
Lime oxide	——	0.50	0.78
Lime carbonate...	0.68	0.29	——
Magnesia	0.32	0.81	0.50
Soda	0.09	0.10	——
Potash	0.05	0.03	——
Manganese	——	trace	0.25

Table 2.—An American Specification for Foundry Sand.

Happily it is not of frequent occurrence. The largest of these cavities that the writer has seen would be about the size of a medium chestnut. The globule which was attached was only partly formed, about the size of a small nut, and the position of the cavity was 15 inches from the top of the casting head and about the middle of a 4-inch thickness of iron.

Soft and Hard Iron from Same Ladle.

Another phenomenon is that soft, hard, and white iron can be cast at one time from the same ladle. Mr. Cook referred to this matter in his address already quoted. He describes the varying degrees by casting a long wedge, the harder and white iron showing itself at the thin end. In the foundry, this peculiarity is an every-day observation, especially in the joint fins of castings. These fins are as white as chalk, although the iron in the thick part is soft gray. I suppose the explanation is this: when the iron is forced into a small space it rapidly sets, so rapidly that solidification has taken place before the carbons have had time to separate, and this goes to prove that graphitic carbon does not exist in metal in the molten state.

Regarding these fins, the extremities of which are quite white, and are from a soft iron mixture, there may be a query. If a sufficient quantity were gathered to make a charge for the cupola, and poured into pigs, say, 4 by 4 inches square, to what extent would the iron assume the former grain and softness? That, the original analysis would give, allowing the usual points for the remelt. In other words, will white iron after remelting remain white or under the conditions named will the iron resume in the pigs its former grain and softness? To all appearances the white iron in the fins is as brittle and hard as the ordinary furnace white iron.

Temperature.

The temperature at which a casting should be poured depends on the shape, size, thickness, the area of the runner gates, and, if a vertically cast mold, some consideration for pressure. It would be foolish in the extreme to put large gates on a mold simply to be able to rush the metal into it at a very low heat, so low it may be that the iron will scarcely leave the ladle. It would be equally foolish to put small gates on and run the iron at a white heat. It is questionable if there can be any definitely fixed temperature in general foundry work that would be of any great advantage. Somewhere between the two extremes just mentioned for runner gates and temperature would meet most classes of work. For example, a roll and a jacketed cylinder both being about the same weight may be poured in the same time, although the temperatures would be quite different. The roll which is a solid body throughout with little accumulated gases to contend with would be poured at a much lower temperature than the cylinder, and the gates are arranged accordingly. There is nothing gained by pouring the roll at a high temperature. There is a decided gain by pouring it at a low temperature, as it greatly reduces the time in feeding. In the case of the cylinder which has so many intricate cores, and from which gases generate and accumulate which must find a way of escape during the process of pouring, and which has so many corners, angles and crevices to pass, and fill, and must not fail to unite—for such the metal should be a decidedly higher temperature. What these two temperatures would be in degrees I cannot say. An experienced and observant foundryman has no great difficulty in gauging the heat of the iron to suit the work in hand. Whatever may be the difference in crystaline structure of iron

that is cast at different temperatures, the matters I have named must have first consideration.

Ferro-Alloys.

In referring to the alloys, manganese, titanium, silicon, chromium, and nickel, I wish to say their use is looked upon by some as doctoring the iron and that instead of doing that the best brands of iron should be mixed in the cupola. Granted ; but that is not the point, at least it is not my opinion. I consider the knowledge of alloys and their influence is a distinct advantage to those who have different classes of work requiring different mixtures of metal. It cannot be said that our best brands of pig could not be subject to improvement. It is continually repeated they are not so good as they used to be. If by adding ferro-alloy to the iron we can get a cleaner, stronger and more durable casting, free from honeycombs, cavities and sulphur-holes, a dense and even grain that will possess good machining qualities, iron that will give better results in physical tests, is it not experimenting in the right direction ? This is apart from the fact that the alloys will often supply the element the pig may be deficient in, because the best brands of suitable iron are not always at hand.

With chrome and nickel I have had no experience, but believe such alloys are found to give great strength to motor cylinders. Manganese and titanium are closely allied in their influence ; both stiffen and render closer the iron up to 1 per cent. The advantages of steel being added to iron in the ladle and cupola need not be mentioned here, they are too well known, and are likely to be continued. I hardly need point out that care must be exercised in handling alloys.

Regarding white iron it may be interesting to note two experiments made by the late Sir Lowthian Bell.

Melting.

First experiment : A 3-foot cube mold was made and filled with white iron melted in a cupola. When broken, the edges of the fractured surfaces were white, toward the center it resembled a gray granite. The runner gate at the bottom was said to have been gray, the riser at the top was said to have been white. That was the experiment and the result. Considering that cube of iron was several tons weight the appearance of gray granite might have been expected. I have no hesitation in saying that if that block had been again remelted and poured into thickness of one and two inches the iron would have been quite white.

Second experiment : Sir Lowthian Bell wished to prove that white iron was produced when the furnace was overburdened and at a low temperature. A bar of white iron was put into the stream of slag close to the hole of a furnace running on No. 3 iron. A basin was arranged to receive the iron after its contact with the slag. When gathered and broken, it was gray iron. This iron was again remelted in a crucible to see if it would reassume the condition of white iron, but it remained gray. I think Sir Lowthian Bell proved his point that a high temperature will produce a gray iron, but I believe there is something more to be said about the white iron being converted into gray. I suggest that the white iron melted in slag containing 27 per cent. of silica would almost be sure to absorb and unite with the white iron, hence the gray iron.

Crystallization.

I wish to further add in reference to crystallization that Mallet says : "It is a law of the molecular aggregation of crystalline solids that when their particles consolidate under the influence of heat in motion, their crystals arrange and group themselves with their principal axis in lines perpendicular to the cooling or heating surfaces of the solid." E. L. Rhead in an able paper upon the same subject observes : "Since a crystal is an aggregate of small particles of the same kind, but arranged in peculiar manner, it is clear that any particle in the crystal is capable of occupying any position in the structure of which it forms a part, and that the form developed will be dependent on the peculiarities of the substance." Also, "If a fused body be cooled with sufficient rapidity no arrangement of particles can occur, and no crystals be formed." From other sources I gather that crystals in various grades of cast iron will assume different sizes and shapes.

From many years' observation of fracture and physical tests, I have come to the conclusion that with certain percentages of metalloids will come the strongest crystals. I am assuming that the crystal is formed in combination with the metalloids, and not crystals of pure iron. If the crystals were pure iron the explanation of strength might be more simple, because the metalloids only in combination would be a very weak body which would intertwine and divide the crystals. It has been proved by many tests that different percentages of metalloids give hardness, softness, toughness, transverse and tensile strength. No. 1 iron is weak and soft. White iron is hard and brittle. To strengthen the No. 1 iron we must get nearer the white, but to what point of nearness ? Again, to soften and reduce the brittleness of white iron we must get nearer to No. 1 iron, but to what point of nearness ? That point of nearness will be discovered when it is ascertained what percentages of the compound will produce the strongest crystals.

Analysis and Strength.

The analysis and strength of Swedish iron as given by F. M. Thomas are as follows : Special qualities of Swedish char-coal, cold blast, gray foundry pig irons have a tensile strength of 16 to 18 tons per square inch, and a transverse strength of 42 to 44 hundredweight on a 2 by 1-inch bar, 3 feet between the supports. A typical analysis would be :

Graphite carbon	2.8	per cent
Combined carbon	0.5	per cent
Silicon	0.2	per cent
Manganese	0.6	per cent
Phosphorus	0.8	per cent
Sulphur	0.03	per cent

I think this analysis is worth reflecting upon by chemists and metallurgists. If we could come within a very much lower transverse break on an average, it would be most satisfactory.

Loam Molding and Core Sand.

Chemically, various kinds of molding sand contain silica, alumina, oxide of iron, lime carbonate, lime oxide, magnesia, soda and potash. The difference between weak, medium and strong sands lies chiefly in the percentages of alumina or clay which is the binder or bond.

For light castings, for which weak sand is used, the percentage of alumina or clay must be low ; if not, the molten iron would not lie quietly in the mold, owing to the sand not being sufficiently porous, and the generated and expanded gases could not escape. Alumina or clay is practically nonporous.

For thicker and heavier castings, for which the medium sand is used, which can contain a higher percentage of alumina or clay, the irritability of the molten iron would not take place owing to the greater thickness and weight. As the castings increase in thickness and weight the sand must be more refractory and the binder stronger to resist the prolonged temperature of the iron. I may also say in neither of the qualities will the castings strip clean unless in green sand (coal dust added), and in dry sand and loam the mold is washed with blacking, of which good qualities are plumbago and blacklead.

Sand containing an excessive amount of clay will crack and shrink in baking, which is undesirable from a molding point of view.

Loam is generally understood to be either or a mixture of these different qualities of sand, being milled in a roller mill with opening and adhesive material, with water or clay wash, to make it soft or stiff consistency as may be required.

The above remarks also refer to core sand.

Table 2 is an American chemical specification for foundry sands.

Blows and Blisters.

A mold that blows is caused by confined air, and gases that are generated by the molten iron coming into contact with the sand and owing to improper provision being made, the air and gas cannot escape any other way than through the risers and runner-gates throwing the molten metal out of the mold.

A blister is often the result of a blow, especially in circular hollow castings, such as pipes that are cast horizontally. Often a blister will occur without a blow being noticed at the time of casting. The chief causes in most cases of blowing and blistering are strong sand, hard ramming, improper venting, or excess of moisture.

Discussion.

J. E. Stead : I think it must be admitted that to depend absolutely upon fracture of pig iron is not to be recommended, for as is well known No. 1 pig iron may contain anything from about 1½ to 4½ per cent. silicon. It often happens, however, that very close irons may also be very high in silicon and sulphur, and on that account the fracture is very misleading. The assistance of the analysis enables the founder to ascertain qualities which the appearance of the fracture alone does not reveal.

	(a) No. 1	(b) White
Silicon	.35	.32
Sulphur	.026	.049
Phosphorus	.02	.04
Manganese	.07	.135
Combined carbon	1.06	3.25-3.50
Graphitic carbon	2.22	
Total carbon	3.28	3.25-3.50

Table 3.—Analysis of Hematite and White Iron.

On many occasions I have been asked why No. 1 or No. 3 pig iron should give thin castings which are hard and white. The foundrymen who sent the samples to me judged entirely by fracture, but the analyses at once showed why the castings were white for they were exceedingly low in silicon and sometimes also high in manganese. Had it been known what was in the pig iron, the silicon contents could have been corrected by the addition of pig iron containing high percentages of silicon and so instead of having obtained white they would have hard gray castings.

Analyze and Inspect.

It is a mistake to assume that when recommending analysis it is to be understood that the founder is not expected to look at the fracture at all. One difficulty the founder must invariably have is to mix his iron in such proportions as to make mixtures suitable for all classes of work, but in my opinion if the melting and casting are sytematized the difficulty might, in a great measure, be overcome.

The author asks the question as to what is the reason or explanation of the 5 per cent. phosphorus in the analysis referred to by Mr. Munnoch. The globule represents approximately the eutectic of iron, phosphorus and carbon, in which some of the original cast iron is dissolved. The reason why the silicon and carbon are lower in this than they are in the normal metal is because they solidified with the first part to crystallize, leaving the residual last portion to solidify impoverished.

White and Grey Iron.

With regard to white iron and white fins I think it may be said without fear of contradiction that every kind of iron, even the very grayest, if when liquid is subdivided sufficiently and then rapidly quenched, is white in fracture when cold. Actual experiment has proved that these white particles on remelting and casting in the ordinary way give gray iron.

The author appears to think that there is some inherent difference between white and gray iron when they are in the liquid state. As a matter of fact the carbon in each case is in solution, probably as carbide or combined carbon, and by very rapid cooling of the metal it is retained in that condition. The higher the amount of silicon the more rapid must be the cooling in order to retain the carbon in the combined condition, and obtain iron with a white fracture. On the other hand many ordinary white pig irons will become gray if the period of solidification is protracted.

Test-bar Troubles.

Thos. D. Wilson : In speaking of tensile and transverse test-bars, my friend has experienced surprises in the different results obtained from bars made under uniform conditions, and getting very varying results. My experience of over forty years' foundry managing and of testing some hundreds of test-bars, is that they are a very unsatisfactory test of cast iron.

Hard Fins on Soft Castings.

Some reference is also made to the hardness of fins on soft iron castings. This is the result of the rapid abstraction of heat. You get corresponding results in all castings where chills are used or any other means of quickly abstracting the heat. I see that Mr. Smith is inclined to think that the remelting of these chilled fins would produce white iron. This has been proved in many ways not to be so, not in reference to fins but the remelting of chilled castings. Also Uehling's and other continuous pig-casting processes when the molten iron is run into chills form pigs which show a closer fracture than when remelted.

E. Adamson : It is refreshing to hear a practical foundryman asked if mixing by fracture is really unreliable. No one can deny that mixing iron by fracture has been successful in the past, and chemistry purely and simply has yet to prove itself as reliable when high-grade irons are used. It is, however, becoming more and more difficult to grade by fracture, and the competent man of 25 years ago would not be such a good man to-day because of the more numerous fractures which exist and the greater number of influences governing them. Mr. Smith has a fairly accurate impression of what governs the fracture of pig iron. I have previously given an analysis of a No. 1 West Coast hematite of Si. .35, and I have had many white irons through my hands with Si. 1.00 and over. The No. 1 iron of such low Si. could be drilled easily, but the white iron, regardless of Si. contents, could not be drilled.

Chemistry and practical experience must go hand in hand. To successfully mix iron to analysis, one of two things is necessary : (1) Having found out by practice which is the most usable irons to continue using them regardless of cost, or (2) having a knowledge of the manufacture of pig iron to know the furnace from which the iron comes and use accordingly; such knowledge, however, could not be expected of a chemist with no outside experience.

Times remelted.	G.	C.C.	Si.	P.	S.	Mn.
1	2.73	0.60	2.48	0.31	0.04	1.09
4	2.54	0.80	1.88	0.30	0.10	0.44
6	2.08	1.28	1.16	0.20	0.20	0.36

Table 4.—Composition of Remelted Iron.

Remelting and Crystallization.

With regard to certain percentages of remelts giving the strongest crystals, these will all depend upon whether the carbons are included. For example, I give two analyses in Table 3, (a) being a No. 1 hematite already mentioned, and (b) a white iron recently through my hands.

Outside of the carbons these are near enough to say they are practically the same analyses. Melt these in two crucibles side by side in the same furnace, and pour each into the same section, and it would be found that the iron (a) would still be gray, while (b) would remain white. Again use one in the place of the other for special work and the result would be absolute disaster.

INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News.

Foundry and Machine Shops.

The Atikokan Co. intend starting up their blast furnace at Port Arthur in the spring.

The B.C.E.R. Co.'s shops New Westminster, B.C., are very busy turning out cars for the line.

The Canadian Northern Railway are stated to be planning extensive additions to their shops in Edmonton.

The Garry Brook Co. is desirous of establishing a malleable iron foundry and machine factory at Arnprior.

Windsor civic authorities have offered a bonus to Cleveland interests to locate a gas plant machinery factory there.

The rolling mills of the Ontario Iron & Steel Co., at Welland, have been started again with a day shift of 60 men.

George H. Langwell's smelting and refining works at Montreal, were recently damaged by fire at a loss of $3,060.

New Westminster, B.C., has offered the Canadian Northern Railway a free site for the erection of shops and repair works.

The settlement of the Steel-Coal dispute is likely to bring about the establishment of the National Rolling Mills Co.'s plant in Sydney.

The scrap iron building of the Grand Trunk Rolling Mills, at Point St. Charles, was destroyed by fire recently. Loss estimated at $10,000.

A branch factory of the Robb Engineering Co., of Amherst, N.S., is to be established at Calgary, with J. F. Porter, of Winnipeg, as manager.

R. J. Wenborn, proprietor of the Nanaimo Machine Works, has moved his machinery and shop equipment into new and more commodious quarters.

An average of 80 tons of flint per day is being taken out of Richardson's mines at Bedford, all of which is being shipped to the electric smelter at Welland.

The Vancouver Pipe and Foundry Co. will erect a large foundry in the southern part of Hastings townsite, B.C. The proposed building will be 150x75 feet.

The Dominion Iron & Steel Co., Sydney, C.B., has resumed work in its rail mill after a close of some weeks. The N.T.R. is taking a great quantity of 80-lb. rails.

The Canadian Antimony Co. intend to erect a smelter and reduction plant at Lake George, N.B., and connect that place with the C.P.R. by building a 12-mile spur.

The United States Steel Corporation is again said to be contemplating locating a branch plant in Ontario, Sarnia, Port Stanley and Sandwich are looking for the industry.

The Manitoba Rolling Mills, Winnipeg, resumed operations lately after being closed down for two months. The company will erect a new building during the summer.

The Gurney Foundry have decided to make a big extension to their machine shop at West Toronto. This building will be of brick, 80x130 feet and will cost about $6,500.

Mr. Thomas, an expert, has arrived in Cobourg to superintend the building of the furnace at the new steel works there. The furnace, when completed, will cost $35,000.

The Canada Iron Corporation, Ltd., will build a new blast furnace at Midland, Ont., and has retained as engineers for the work, Frank C. Roberts & Co., of Philadelphia.

Another new industry is the Welland Stove Works, which has just been organized. Plans are ready for a factory building, and 50 hands will be employed beginning June 1.

Canada Metal Co., who have just completed a plant for special work will break ground at an early date for their brass foundry adjacent to the first building, Fraser Avenue, Toronto.

The rolling mills and horseshoe factory at Belleville, which were recently taken over by P. J. Smith and D. S. Thornton, have been running steadily since the change in ownership.

The Silliker Car Company's shops at Halifax, are working full time, and it is understood that they will shortly be compelled to put on a double shift so as to keep up with their orders.

The Amherstburg Iron Works is again running full blast with a large force of men. Messrs. Woods, the proprietors, have installed the old waterworks boiler to provide steam for their new engine.

Rhodes, Curry & Company, Amherst, N.S., are now turning out about ten box cars per day and are also at work upon passenger cars. Their men are working full hours for the first time this winter.

It is announced that the Marine and General Engineering, Sydney, C.B., which has, in common with other concerns been retarded through the financial depression, will shortly commence active operations.

The Tilbury Iron Works, owned by R. J. Clements, suffered from a bad fire recently, which caused damage to the extent of about $500. There was no insurance. A defective gas mixer was the cause.

The Butterworth foundry, Ottawa, is working overtime on rush orders for shanty heaters and shanty ranges. A bright outlook is presented for a good household range business by this firm towards spring.

The warehouse and shops of the Stuart Machinery Co., Winnipeg, were badly damaged by fire recently. The estimated damage to the building and contents is placed at $25,000 fully covered by insurance.

Indications point to a speedy commencement of work at the steel works, Cobourg. The machinery has now arrived and is being placed in position. An 80-foot crane is in operation and used in placing the machinery.

The Beach Foundry Co., Winchester, Ont., have ordered a new engine for their establishment which will be placed in position as soon as it arrives. It is expected that the foundry will resume operations in a few days.

St. Clair Bros. are moving their machinery into the new factory which they have just completed at Galt. The machine shop is of concrete construction, 50x100 feet. The forging shop is connected with the machine shop and is much larger than the one formerly occupied by the company.

Goldie & McCulloch Company, Galt, is suing the town of Uxbridge. The firm claims possession of machinery valued at $2,600, furnished by them to Palmer Piano Company. The town is mortgagee of the piano company, which assigned last September.

The Grand Trunk Railway has received an order from the Montreal and Southern Counties Railway for six electric cars to be built in the G.T.R. shops at Point St. Charles, and delivered in sixty days. The cars are wanted for service on Victoria bridge.

Announcement has been made that the Page-Hersey Co., has let the contract to the Berlin Construction Co., Berlin, Conn., for the erection of large mills at Welland for the manufacture of all sizes of water and gas pipe. The work of construction will begin at Welland at an early date.

Improvements to the Winnipeg shops are planned by the Canadian Northern, and on the arrival of spring, work will commence on several additions to the works at Fort Rouge. A carpenter shop, costing $25,000, will be erected and smaller additions to the present buildings will also be made.

A new industry known as the Welland Tin Plate & Sheet Company, is being promoted. A two-mill plant, tin plate, polished sheet, tern plate, Canada plate, and steel sheet of every description, will be manufactured. The plant will have a capacity to manufacture 100,000 boxes or 5,000 tons.

The brass foundry of William Keating, 237 Landsdowne, Ave., Toronto, was destroyed by fire recently, loss $15,000. The loss is principally to the stock of brass goods, plumbers' supplies, etc., which was a large one, and to the machinery. The stock is valued by Mr. Keating at $7,000 and the machinery at about $8,000.

It is understood that the Collingwood Shipbuilding Company has given up the idea of leasing the government dry dock at Kingston and establishing a repair shop in connection therewith. There is a possibility, however, that the Kingston Locomotive Works Company may secure the dock and establish necessary shops.

The Manitoba Iron Works are planning an addition to their buildings at Winnipeg, at an initial cost of over $150,000. T. R. Deacon, manager of the company, states that when the addition is completed the capacity of the work will be at least 20,000 tons of steel a year, enabling the construction of the largest bridge spans required.

A big manufacturing plant for the purpose of turning out locomotives and lumber and logging engines will probably locate in Vancouver within a short time, if plans now under way are completed. Seattle capitalists have had representatives there for several days, who are perfecting an option on ten acres of ground in the East End, on which to erect buildings and install the necessary machinery.

The Canadian Webber Engine Co., with a capitalization of $300,000, having all the patent rights of the American Webber Engine Co., of Kansas City, and employing a minimum of 100 hands will open up the old Dyment foundry at Barrie and manufacture gas producers and gas engines. Their output will be sold throughout the whole Dominion. Mr. Dyment will be one of the largest shareholders and president of the company.

F. L. Leighton, managing director of the Vancouver Engineering Works, saying that by June 1, his company will be manufacturing steel castings, the first to be made in Canada west of the great lakes. The plant for doing this work will cost $100,000. What is known as the converter process of making steel castings will be installed. Electric cranes will be used, in all the operations and this department will be carried on by electricity. The plant will be of the most modern description.

Somerville Limited, Toronto, who have recently completed one of the finest and most perfectly equipped brass plants on the continent, are already finding it too small to meet the requirements of their rapidly growing business, and have taken out a building permit for a large extension to their foundry. They are also extending and refitting their show rooms and offices on Richmond street, where the company will greatly add to their already extensive display of plumbing fixtures and appliances.

A meeting of the creditors of the Reid Foundry and Machine Company, Ingersoll, was held a few days ago. It will be remembered that this company assigned for the benefit of its creditors recently. At the meeting about seventy-five were present, and, after hearing the report of the assignee, Walter Mills and W. F. Johnston, Ingersoll, and Mr. Marshall, of Hamilton, were appointed inspectors. A proposition was advanced for the reorganization of the company, and it is expected that operations will be resumed at the plant in a very short time.

A new iron industry is to be started in Toronto shortly, though under what name it will operate is not as yet known. At a recent meeting of the Board of Control the statement was made that the company, which has been formed had secured options on some factory sites, and the company's representatives stated their intention of building immediately, and asked that they be allowed to build branch lines connecting their buildings with the Canadian Pacific and the Grand Trunk. As the company was already preparing to build the board granted the request.

The Huntsville Engine Works Co. which has been running for a year past under a partnership arrangement, has been changed into a joint stock company. The President and General Manager is John Youngson who has been the principal owner under the former partnership. John Whiteside is Vice-President, and G. F. Elliot, who came recently from Hamilton, is Secretary-Treasurer. The directors are Messrs. Youngson, Hutchison and Readman, the latter two being the chief associates with Mr. Youngson since the present business was established.

A smelter is to be built near Nanaimo, B.C., to treat tin and other ores. The smelter is to be built by the Pacific Tin Mining & Smelting Company, a Canadian concern, which was incorporated Jan. 14, 1909. The company proposes to commence operations at once. The company has secured the services of a Swansea engineer to superintend the new smelter, Mr. F. M. Perkins, a metallurgical engineer, formerly of the Magdalena smelter of Mexico, and also of the Mexican Smelting & Refining Company. Mr. Perkins is to be managing director of the new concern.

A number of London men have, it is understood, formed a company to establish machine

works in the east end of that city and their plans will be made public shortly. A site has been selected along the G.T.R., and when the concern is started in operation it will give employment to a goodly number of hands. The promoters will, of course, expect to share in the city council's proposition to lay aside $100,000 for the purchase of free sites for manufactories, provided that proposition gets the approval of the Legislature, which, in view of the strong opposition which has developed, is none too certain.

Fire recently destroyed the works of the new Burrell-Johnson Iron Company at Yarmouth, N.S. The fire started in the oil room, which was situated near the machine shop. The fire also damaged the four-storey stone warehouse and other buildings on the wharf, filled with finished stoves and costly patterns of machinery, etc. The buildings entirely destroyed were the machine shop, engine and boiler house, stove-fitting shop, pattern shop, draughting rooms and offices. The boiler shop across the street was badly damaged, as was also the brick foundry adjoining to the north. In the machine shop was a large quantity of machinery ready for delivery, all of which was destroyed. By the loss of the patterns the company will be greatly handicapped in completing their contracts. As a result of the fire 150 men are thrown out of employment, and nearly all of them lost their effects. The property loss is estimated at $125,000, on which there was only $10,000 insurance.

The rail mill of the Dominion Iron and Steel plant at Sydney is turning out at present an 85-pound rail order for the C.P.R. During the past two months an exceptionally high average in the quality of steel manufactured by the plant has been maintained, 98 per cent. of the finished material being passed by the inspectors. This record is said to be unequalled in any of the big plants across the border. Repair men are at work in the different departments of the plant getting the machinery in first-class condition for the big rush that is expected this summer. The staff at the plant is being increased as rapidly as possible and in a short time the force will have reached its full complement. Following the meeting of the Steel directors in Montreal, a boom is expected in construction at the plant. About two years ago foundations were put in for an extra battery of coke ovens and it is practically certain that construction work will commence on the ovens as soon as the weather conditions will permit. To "put in" a battery of coke ovens will require the services of upwards eight hundred men, the majority of whom must be skilled men, and it will consume practically all the summer before the work is finished. Other additions are also spoken of in connection with the works.

Municipal Undertakings.

A new main sewer will be constructed at Sarnia.

A waterworks system will be construsted at Burlington.

Montreal is considering establishing a filtration plant.

Exeter, Ont., is thinking of constructing a waterworks system.

Hamilton is buying land for its west end sewage disposal works.

Winnipeg's proposed new sewerage system is estimated to cost $7,000,000.

Wetaskiwin, Alta., will instal a waterworks and sewerage system this year.

Tenders are asked for supplies of cement and sewer pipe required by Brantford for 1909.

Kingston may extend its waterworks mains to all parts of the city, at a cost of $35,000.

Sydney, C.B., will spend over $90,000 in sewers, water extension, bridges, fire station, etc.

Peterboro's water commissioners advocate installing a new waterworks plant, to cost $120,000.

A by-law will be submitted shortly to the ratepayers of Thorold to raise $15,000 for waterworks.

Verdun's $50,000 water supply system is being rapidly pushed and is expected to be finished by June.

Fort Erie ratepayers will vote on a by-law to authorize the raising of $50,000 for waterworks purposes.

Estevan, Sask., ratepayers will probably vote on a by-law to raise $30,000 for fire protection purposes.

Meaford ratepayers have passed a by-law authorizing the instalation of a waterworks filtering basin.

Point Grey, a suburb of Vancouver, will have ... trained by trunk sewers running through Vancouver.

Simcoe, Ont., ratepayers have passed a by-law authorizing the instalation of a waterworks system.

The Hamilton sewers committee will procure more land for the proposed west end sewage disposal works.

A by-law will probably be submitted to the Pembroke, Ont., ratepayers to spend about $125,000 for a water system.

The Roberts Filtration Co., of Philadelphia, Pa., has been awarded the contract for the instalation of a filtration plant at Edmonton, at cost of $16,500.

The Gartshore-Thomson Company received the contract for supplying the iron castings required by the Hamilton sewers department, at $1.95 a hundred pounds.

A. Mercer, Hamilton, was given the contract at $2.175 of laying an iron pipe down the side of the mountain at Hamilton to connect the mountain and city sewer systems.

Tenders are asked for materials for Saskatoon's waterworks and sewerage works as follows: Cast iron pipe and specials, 280 tons; fire hydrants, gate valves, etc.; sewer pipe, 20,000 feet; pumping machines.

Dominion, C.B., ratepayers authorized the town council to borrow $20,000 for the instalation of a permanent water supply. The water will be supplied by the town of Glace Bay from their standpipe at Cadegan's brook.

Mr. Barlow, Montreal's city surveyor, stands firmly by the recommendations he has made to the Road Committee in regard to the placing of orders for the machinery needed for the department's new shops at Point St. Charles.

The general scheme for the reorganization of the civic light and power department, at Kamloops, which has been laid before the city council, involves an expenditure of $16,500. This includes the purchase of a compound direct engine, with a capacity of 150 h.p., costing $9,000; a 120 k.w. dynamo, indirect, $3,200; 150 h.p. boiler at $2,100, new wiring, $2,200, and contingencies, $1,000. This equipment will provide abundance of power.

Railway Construction.

An electric railway is proposed to be built from Medicine Hat to Calgary.

The Canadian Pacific Railway will construct a branch line from St. Mary's to Stratford. The distance is 23 miles.

The Peterborough Radial Railway Company contemplates extending its line from Clear Lake to a point in Stony Lake in Peterborough County.

The Niagara Peninsular Railway Co. will apply for permission to build a branch line of electric railway from Port Colborne through Welland.

In addition to the Weyburn line, which the C.P.R. will construct this season, the company will lay a line from Lethbridge to connect the Macleod branch with the Calgary and Edmonton line, a little north of High River station.

Tge Flathead Railway Bill has been reported favorably to the B.C. House and there is every prospect of its being passed. The proposed route of the new line is from a point on the eastern British Columbia railway at or near the Town of Corbin, to the international boundary line, a distance of nearly fifty miles.

The Victoria & Barkley Sound Railway intend to build from Victoria to a point on Barkley Sound, in the neighborhood of Sarita river, by way of Otter Point and San Juan, with branch lines not exceeding twelve miles in length from any points on the main line to points adjacent to it.

The New York Central Railroad will this year buy 101,000 tons of steel rails. The Algoma Steel Co., Sault Ste. Marie, Ont., will supply 5,400 tons, presumably for betterment use on the Michigan Central road in Ontario, especially in connection with the tunnel under the Detroit River at Windsor.

The C.P.R.'s program of railway construction this year east of Fort William will include a branch line from Coldwater Junction to Peterboro, which will be part of the scheme for a short rail route between Montreal and Georgian Bay ports. It is anticipated also that during the coming season forty additional miles will be added to the double-tracking of the C.P.R. between Toronto and Montreal.

The C.P.R. is preparing plans for improvements to its property at Sherbrooke, which will entail an expenditure of close on $100,000. They some time ago purchased a property close to their present terminus there, for which they paid $29,500. It is the intention of the company to build a handsome new station on this property, and to turn the present station over for use as a freight shed. In addition to this a new roundhouse will be built, and the shops and sheds increased.

Electrical Notes.

The United Heat, Light and Power Co., Goderich, has obtained a charter.

The British Columbia Telephone Company will install a system at Cumberland.

The Maple Leaf Milling Co., Brandon, may put in an entirely new power plant.

The Canada Automatic Machine Telephone Co., will be operating in Brantford by May 1.

The Brandon Board of Trade suggests getting power for manufacturing purposes from Winnipeg.

Shelburne, Ont., is now illuminated by electric light, the power being supplied from Horning's Mills.

Portage la Prairie council has approved the plan for a power and lighting plant and a by-law will be introduced.

Grimsby, Ont., is about to take over the electric lighting system from the company which has heretofore operated it.

Beamsville, Ont., is about to take over the electric lighting system from the company which has operated it heretofore.

A by-law to issue $10,000 debentures for an electric light plant will be at once submitted to the ratepayers of Listowel.

The Manitoba Legislature will vote upon the matter of expending $25,000 for a new telephone building at Portage la Prairie.

The Kentville, N.S., Electric Light & Power Co., will install another small generator in their lighting plant in the future.

Vancouver's city electrician has completed specifications upon which tenders will shortly be called for a police signal patrol system.

It is understood that the Hydro-Electric engineers have placed the requirements of Windsor Walkerville and Sandwich at 2,500 horse-power.

Tenders for Toronto's municipal electrical distribution plant have been advertised in a number of Canadian and United States technical journals.

The work of putting in a new unit of ten thousand horse power at the Vancouver power house of the B.C. Electric Railway Company is progressing.

A by-law granting a franchise to F. Laidley for the installation of an electric light and gas plant at Swift Current, Sask., has received its second reading.

The Acadia Telephone Co., Moncton, N.B., are applying for incorporation to construct and operate a telephone system in Kent and Northumberland counties.

J. R. Booth is building a power house at the Chaudiere, on the site of the first sawmill burned there fifty years ago. This building is also for a boxwood factory.

Montreal will fight the electric supply companies for the control of the streets, by obtaining legislation prohibiting corporations erecting poles without permission.

Peterboro' city council has granted the Peterboro Radial Ry. Co. an extension of time to build the electric railway's extensions in that city. The plans entail an outlay of $400,000.

Electrical Engineer Aitken stated recently that the specifications for the municipal electrical distribution plant were finished on Saturday, and forwarded to Alexander Dow, Detroit, the consulting engineer.

The by-law to raise $15,000 for the purpose of completing the expenditure undertaken in the construction of the Hydro-Electric power plant at South Falls, has been approved by the ratepayers of Gravenhurst.

Application will be made for the incorporation of the Kapitchouan Railway Company, for the construction of an electric railway from Lake Kapitchouan to Montreal with branch lines of about twelve miles in length.

The Saskatoon Electric Supply Co., are preparing for what promises to be the busiest year in the history of this enterprising and progressive firm, by installing a very heavy stock of new goods, notably dynamos and motors.

Two carloads of plant, consisting of engines, boilers, steam drills, derricks and other machinery, have arrived at Grand Falls, N.B., and are now being set up for the beginning of the operations of the Grand Falls Power Company.

The Grand Falls Power Co., Grand Falls, N.B., have let the contract for the first unit in an 80,000 h.p. hydroelectric plant. The first unit is to be a 800 k.w. generator, the contract being secured by Kilmer, Pullen & Burnham, Toronto.

Engineer Sifton, London, says that city should erect its own plant. It would cost not more than $235,000. He has also stated he could duplicate the London Electric Plant for $275,000, for which the company ask $506,000.

Kamloops, B.C., will have an improved lighting service in the course of two or three

months and the expense involved in the improvements to the present plant will be about $7,000. It is hoped then to have twice as much power as was had during the winter.

J. S. Armstrong, Rothesay, N.B., has given notice that a bill will be introduced at the approaching session of the N.B. Legislature to incorporate the St. John Power Company with power to carry on a general lighting, heating and power business in any part of New Brunswick.

The electric lighting plant of the Provincial Hospital, at St. John, practically destroyed by a recent fire, has been entirely rebuilt by the Vaughan Electric Company and is now about in running order again. The job has been one of the largest ever undertaken by a St. John electrical firm.

The Calgary Power & Transmission Company have engaged Cecil B. Smith, consulting engineer, Toronto, to report on their power proposition at Horseshoe Falls on the Bow. Mr. Smith states that this fall alone will produce at least 8,000 horse power.

Tenders will be taken shortly by Smith, Kerry & Chace, Toronto, for the construction at Orangeville of the power house for the Dufferin Light & Power Company. The power house will contain three 150 k.w. hydraulic units with step-transformers to a transmission voltage of 22,000 volts.

The general scheme for the reorganization of the Kamloops civic light and power department involves an expenditure of $16,500. This includes the purchase of a compound direct engine with a capacity of 150 K.W., costing $9,000, a 120 K.W. dynamo indirect $3,200, 150 h.p. boiler at $2,100, new wiring $2,200, contingencies $1,000.

The Toronto Board of Control of Toronto passed the specifications and forms of tender for three-core cable for the city's electric power distribution plant. The specifications for the plant and engines will be ready in six weeks, and it is hoped to start work on the underground construction in a few weeks' time.

J. C. Kennedy, engineer-in-charge of the Slave Lake Power Co., Vancouver, recently visited Okanagan for the purpose of going over the site of the Coteau Power Co., and to verify the plans of their engineer, A. E. Ashcroft, with whom he agrees that arrangements may safely be made for the development of 5,000 horse-power required to operate a system of tramways in this district.

The Montreal Electric Light Company are proceeding with the erection of their distribution system in the city of Montreal and for immediate needs have closed a contract with the Saraguay Electric & Water Company for the supply of power in bulk. They expect to start construction work early in the spring on a 10,000 h.p. steam plant. This steam plant will ultimately be used as a reserve for their water powers when developed.

With the intention of harnessing the water power of Eel River, near the boundary of York and Carleton counties on the St. John river, N.B., George P. Olts, of Meductic, has applied to the N.B. Legislature for the incorporation of the Meductic-Eel River Electrical Power Company. The company's object is to erect and maintain a dam across Eel River, near the highway bridge, to generate electric current there and supply power and light to the neighboring country.

Contracts have been awarded by the Street Railway Company, as follows: Federal Electric Company, Montreal, Que., aluminium, contract price $4,500. The nearest competitor was the Northwest Electric Company, of Edmonton, whose price was $50 lower. The Northwest Electric Company will furnish the overhead specials for $1,947.90. Wm. Stuart & Company will supply the wooden poles needed for $3,400. Copper bonds will be supplied by the Canadian General Electric Company, Peterborough, Ont., for $5,070.

The bill to incorporate the Eastern Ontario County Electric Belt Line Company, capitalized at $1,000,000, is now before the Ontario Provincial Government. The company proposes to built an electric line from Lancaster township, running along the St. Lawrence to Cornwall, thence to Brockville, thence northwesterly through to Dundas and Lanark to Darling township, passing through Athens, Lanark, Perth, and connecting with the Lanark Counties Electric Railway Company, and from Morrisburg through Dundas, Russell and Carleton.

Tenders will be received up to Thursday, April 15th, 1909, for the manufacture and delivery at Winnipeg of two testing transformers, viz.: One 30 k.w. at 80,000 volts and one 200 k.w. at 200,000 volts, also for control equipment therefor. Copies of the instructions to bidders, specifications and forms of tender may be obtained at the power engineer's office, Carnegie Library building, Winnipeg, Manitoba. These specifications may also be seen at the office of Smith, Kerry & Chace, Confederation Life Building, Toronto, Ontario. M. Peterson, secretary, office of the Board of Control, Winnipeg, Man.

City Engineer Bell has completed all the plans for St. Thomas ordered to be prepared by Chief Engineer Sotham, of the Hydro Electric Commission. There are six plans altogether. One shows the grounds and location of the L. H. & P. plant on a small scale; another the engine room on a larger scale; a third, the city lighting circuit, showing all arc lights and gas lamps; fourth, the power circuit, with all users and amount of horse power; fifth, the incandescent or alternating light circuit, amount used and size of transformers; sixth, the telegraph and telephone line, also the street railway line.

The style of tower to be used for carrying the Hydro-Electric high tension cable from Niagara Falls to the various transmission stations has been finally approved and the actual work of construction will be pushed forward with all speed. Recently a test was made of two styles of tower, one designed by the engineers of the Hydro-Electric Commission and the other designed by Cecil B. Smith for the McGuigan Construction Company. The Commission's tower gave best satisfaction and it was selected as the standard tower for use on the transmission line. Apart from some small difference in the character of the wire-carrying arms the principal advantage the tower selected has over the McGuigan tower is in the fact that the supports are constructed in such a way that a farmer can drive a loaded wagon between them while in the McGuigan tower the cross supports prevent this.

In a recent statement Frederic Nicholls, of the Canadian General Electric Co., Peterborough, is quoted as follows: "This company has secured more new business during the past two months than during the preceding six months, and we have more enquiries on our books than we have had since 1906, and are, therefore, looking to the future with confidence." This is of special interest to Peterborough, their shops there having suffered with other industries from the conditions of the past year. The company secured the contract let by the Hydro-Electric Commission for the equipment of twelve stations on the transmission line. The commencement of this work will mean a renewal of the activities of the works.

Brantford city council has adopted a by-law ratifying the agreement with the Western Counties Power Company now operating here as a subsidiary of the Cataract Power Company. This company in 1906 was given a 25-years' franchise for commercial and domestic lighting at a maxsimum rate of nine cents per kilowatt. Its street lighting contract with the city, however, at a rate of $55 per year, expired last September, and has continued until the present without any specific agreement. Under the new agreement the company gets a five years' contract for street lighting, charging the city $48 per light per year for street lighting, and in addition agrees to reduce its rates to 7.65 cents per kilowatt for commercial and domestic lighting. On street lighting this is a saving of $8,750. The rates for commercial and domestic lighting are reduced 7 per cent., which will mean a taving to the citizens of $2,100 per year, or $10,500 in five years, making a total saving in street and private lighting of $19,250 in five years. While the contract is for five years only the city can renew it for 10, 15 and 20 years, on the present terms or better rates if conditions will permit at the end of five year periods. As a further safeguard the agreement calls for the company to furnish Brantford with light and power for all purposes 10 per cent. cheaper than the price received by any municipality using Hydro-Electric commission power, due allowance being made for the differences in the distance of transmission, and provided also that such municipalities are not getting rates be low cost. This means that rates are 10 per cent. better than the Hydro-Electric Commission could do here.

Structural Steel Notes.

The estimated total cost of the proposed Holland river bridge is $15,400.

Plans have been prepared for the new Smith street bridge, Peterboro. It will cost $28,000.

The Petrolea, Ont., council have passed a by-law to erect a bridge at Black Creek at a cost of $5,500.

The residents of Ottawa South will present a petition for the construction of a new bridge at Bank street.

There is a movement on foot at Kingston for the construction of a subway under the tracks of the Grand Trunk Railway.

The enlargement of the Saskatchewan bridge at Edmonton, will be brought before the Dominion Government this session.

It is estimated that $100,000 will be spent in repairing bridges throughout New Brunswick which were damaged by the recent freshet.

It is expected that a steel bridge will be erected next fall, at Lindsay, to take the place of the present Wellington street structure.

The C.P.R. intend to construct a 3,000 ft bridge over the South Saskatchewan River for an extension of their Moose Jaw Lacombe line.

The Windsor Board of Works are negotiating with the Michigan Central Railroad for the construction of a new bridge over their tracks in that city.

The construction of the $600,000 steel bridge at New Westminster, to replace the present frame bridge across the north arm to Lulu Island, has been begun.

A deputation from the Ottawa city council waited upon the Hon G. P. Graham to ask for an appropriation for a bridge over the canal at Mutchmor street.

The Western Bridge & Equipment Co., Chatham, has received the contract for a new steel bridge in Harwich township, the materials going forward to-day.

Engineer Kelly, of the G.T.R., was recently in London, and stated that plans are under way for the erection of a new station and for considerable improvement.

The Alberta Provincial Government are completing this spring a new steel bridge of two spans with three cement piers, over the Red Deer river ar Red Deer town.

The William P. McNeill Co. will add to their crew of employes, and the erection of the steel for the new spans of the Fredericton Highway Bridge will be proceeded with rapidly.

The Hunter Bridge & Boiler Company have been awarded by the Bruce County Council the contract for the construction of the Stirton bridge at $13,300 for complete bridge, steel and cement work.

Plans are being prepared at the N.B. Provincial Public Works Department for new steel bridges at Chipman, Queen's County, Fredericton Junction, Sunbury county and Buctouche, Kent county.

The estimates recently presented to the Sydney, C.B., City Council include items of $3,500 for a new bridge at Wentworth Creek and Bentinck street, and $8,000 for a new bridge at Whitney avenue.

The Provincial Government of Alberta will this summer start a new steel bridge crossing Red Deer river, some eight miles due east of Red Deer town at the crossing locally known as Bremner's or Ericson's.

The Saugeen Council let the contract for the erection of Stewart's Bridge, near Port Elgin. The steel work will be done by the Hunter Bridge and Boiler Company, Kincardine, the contract price being $1,500.

In answer to a question by R. L. Borden, the Minister of Railways & Canals, stated that it was expected that plans and specifications for the rebuilding of the Quebec bridge would be completed this year and tenders taken.

Plans for the proposed new Prairie Siding bridge have been made by Engineer Jas. A. Pell, St. Thomas. The plans call for a bridge of 200 foot swing, and the cost is estimated at $31,551 for a bridge with concrete approaches and plank floor on the swing.

It was stated at the head offices of the Grand Trunk Pacific Railway Company that the company was willing to undertake the building of the Quebec Bridge, and that it would agree to complete the structure to the general satisfaction within the period of three years.

Notice is given at Ottawa that tenders will be receive at the office of the commissioners of the Transcontinental railway, until April 8, for the construction and erection of a steel and concrete bridge, and approach spans over the Red river, between Winnipeg and St. Boniface.

The Montreal city authorities are preparing to make a big fight against the demand of the Canadian Pacific Railway that a new iron bridge should be constructed to replace the present wooden structure which crosses the railway tracks on St. Catherine street east.

The Canadian Bridge Works, Walkerville, have been awarded the government contract for the construction of 3,000 steel towers in connection with the Ontario hydro-electric commission's plan for bringing Niagara power to Windsor over government-owned cables. A public test of one of the towers was given in the yards of the works. The tower, which is 65 feet in height bore all the strains put upon it.

Planing Mill News.

Odleifson & Thornsteinson have started a saw mill at Gimli.

A sawmill will be erected at Sturgeon Falls, Ont., by Oscar Rusk.

The Albion Brick Co., Vancouver, will build a saw and planing mill.

A joint stock company will erect a veneer mill at Mansonville, Que.

The Carnegie Milling Company are erecting a sawmill at Port Perry, Ont.

The Dawson Lumber Company's mills at Yarmouth, N.S., have resumed operations.

C. Jobin & Company, St. Augustine, Que., have been incorporated to operate sawmills.

A shingle mill will be built at Esquimalt, by H. Bacus, Seattle, who has already selected the site.

J. S. Emerson, Vancouver, is building a planing mill and sawmill at Eburne, on the Fraser River.

An addition will be built to the Arrowhead lumber mills at Kamloops, B.C., at a cost of $20,000.

The Davidson-Ward Lumber Co., are erecting a 20-machine shingle mill at Loughborough Inlet, B.C.

Alex. Kippen, proprietor of the Perth planing mill, started the plant running again a few days ago.

The saw mills at St. Croix, Que., owned by C. Auger were recently destroyed by fire at a loss of $10,000.

C. A. McGillivray, Bellingham, Wash., has purchased a site at Vancouver, for the erection of a large sawmill.

The Michigan Pacific Lumber Co. are stated to be planning the erection of a large mill at Harriston, 30 miles east of Vancouver.

George Othmer & Sons, West Derry, are building a new sawmill at Buckingham, Que., to replace the one destroyed by fire a year ago.

Flewin & Sons, Vancouver, have been incorporated with a capital stock of $50,000 to erect and operate sawmills, build steamboats and barges, etc.

The Powell Lumber and Door Co., capitalized at $50,000, has been granted a charter to take over the lumber business of the Rathbun Co., in Toronto.

All the machinery is on the ground for the new lumber mill of the Fischer Lumber Co., on the line of the Transcontinental Railway near Good Lake, Ont.

The Edinboro' Timber Co., Vancouver, capital $200,000, has been granted a British Columbia charter to manufacture lumber, run sawmills, make sashes and doors.

The Converce & Brown Shingle Co. have completed arrangements for the construction and operation of a shingle mill at Bazan Bay, just south of Sydney, B.C.

Pennsylvania and Chicago capitalists havé been inspecting 117 square miles of timber on Moresby Island, B.C., owned by Wallace, McMillan & Murray, Queen Charlotte. A sawmill will be erected.

The Canadian Pacific Sulphite Pulp Company, which have a mill at Swanson Bay, have been awarded the contract by the B.C. Provincial Government for $3,500,000 feet of spruce lumber, which will be used for street improvements.

One hundred and forty thousand acres of timber land were disposed of last month by an English syndicate to Vancouver capitalists for a figure in the vicinity of $800,000. The plans are for the erection of pulpwood and sawmills on the property situated on the east coast of Vancouver Island, one hundred miles north of Vancouver.

The old sawmill which has been running at Whitechurch in the county of Bruce since 1881 has just been purchased by a man in Calgary, and is now being shipped away to the West. Where there were formerly a large number of sawmills in operation in the counties of Huron and Bruce there are now scarcely any, and many express the opinion that woodworking factories will have to follow in their wake.

H. J. Crowe, president of the Newfoundland Pine & Pulp Company, says that a big publishing house in London has already expended $5,000,000 in the purchase of timber lands and the erecting of pulp mills in Newfoundland. The Reed English paper manufacturing concern has expended almost an equal amount. A large mill has been erected at Point Leamington, which has already turned out over 2,000,000 feet of lumber. The Badger mill has also turned out over 1,000,000 feet of good pine.

Building Operations.

The C.P.R. will build a grain elevator at Vancouver.

C. A. Ahrens will build a new and larger shoe factory at Berlin.

The Tent and Mattress Co., Saskatoon, are putting up a new warehouse.

The B.C. Soap Works, Victoria, contemplate large additions to their factory.

The Gerhard Heintzman Piano Co. are erecting a six-storey warehouse at Toronto.

A new pulp mill will be erected at East Angus, Que., in the spring at a cost of $250,000.

The Copp-Clark Company have bought a site in Toronto and will build a new warehouse and bindery.

Bentley & Marsh, makers of sporting goods, Niagara Falls, are erecting a new and larger factory.

The Toronto Show Case Company are preparing plans for the erection of a large factory in that city.

The Canada Cycle & Motor Company will erect a 4-storey building at Toronto, at a cost of about $50,000.

Construction will shortly commence upon a large new factory for the Oxford Knitting Co., at Woodstock, Ont.

The Canadian Industrial Company, Vancouver, will erect a large paper and pulp mill at a site on the Powell river.

The Vancouver Milling & Grain Co., are rebuilding the mill recently burned at Vancouver. The new mill will cost $40,000.

Pratt & Lambert, varnish manufacturers, Buffalo, have purchased a site at Bridgeburg, Ont., where they will build a Canadian factory this summer.

R. Bowman is getting out plans for a new concrete warehouse at Victoria, which will cost $30,000. It will be five storeys in height, with electric elevators.

Samuel Brown, Winnipeg, has been awarded the contract for the erection of the new freight sheds for the C.N.R. at Saskatoon. Approximate cost, $20,000.

J. H. Griffin, general inspector and traffic agent of the Great Northern Railway, states that an elevator will be erected in Brandon early next season.

The Victoria Creamery Co. are about to take out at Victoria, a permit for their new building on Broad St., which, with machinery and land, will amount to $35,000.

The American Column Co., Battle Creek, Mich., will build a one-storey factory building at Niagara Falls for their Canadian business. The cost is estimated at $25,000.

An additional $50,000 will be required to complete the Calgary city hall. The extra amount will be used for the raising of a tower, installing an elevator, and equipping a laboratory.

Weatherstone & Sons, manufacturers of door mats, etc., Brantford, have completed the foundation for a new factory, which was found necessary owing to their business having outgrown the present premises.

The trustees of the Toronto General Hospital are considering the appointment of an expert to pass upon the plans for the new hospital. The plans submitted call for expenditures respectively of $1,350,000 and $1,210,000.

Henry Disston & Sons, saw makers, Philadelphia and Toronto, have bought for $50,000 a four-acre block of land in Toronto, on which they will erect a new $80,000 factory in the spring, to employ 300 or 400 men.

The Canada Chemical & Wood Distilling Company, Chilliwack, B.C., capitalized at $20,000, are applying for incorporation. Arrangements are now being made for the erection of a building and the installation of machinery.

The Western Canada Wood Pulp & Paper Co. are said to have acquired the entire pulp limits, foreshore rights and water privileges from the Quatsino Power & Pulp Co., and will at once erect a large mill on Marble Bay, Quatsino Sound, B.C.

Forty-three new elevators will be built in Alberta, during the current year. The Alberta Pacific Elevator Co. will build twenty-five, the Alberta Grain and Elevator Company, eight, and private firms ten. The majority will be in the southern part of the province, although a few are as far north as Strathcona.

Among the buildings to go up this year in Toronto are a new fire hall and police station at East Toronto; fire hall on Perth Avenue, and an addition to the main pumping station. Then there is the General Hospital and the additions to Western and Isolation hospitals, some university buildings, and a technical school, several warehouses and many dwellings.

The Frost Wire Fence Company, Hamilton, will make an important addition to its plant within the near future. The firm is going into the manufacture of its own wire and will erect a wire mill for that purpose. The proposed new building will cover about an acre of ground and with equipment will cost in the neighborhood of $50,000.

General Manufacturing News.

The B.C. Soap and Paint Works, Victoria, are contemplating putting an addition to their factory.

A $35,000 hydraulic placer plant will be erected on Ruby Creek, Atlin County, B.C., by Boston and Seattle interests.

The Heaton Acetylene Co., Ltd., formerly of Hampton, N.B., manufacturers of acetylene generators, have located in Amherst.

Robertson Brothers, Toronto, candy manufacturers, will erect a five-storey addition to their factory and boiler house, at a cost of $40,000.

The plant of the Canadian Asbestos Co., Lachine, Que., was destroyed by fire recently. Estimated loss, $40,000, fully covered by insurance.

The Packard Electric Co.'s automobile works at St. Catharines, which were closed down some time ago owing to trade depression, are starting up again.

Wortman & Ward, London, Ont., manufacturers of washing machines, pumps, etc., contemplate the erection of a factory at Estevan, Sask., at a cost of $75,000.

The Philip Carey Co., 112 Bay St., Toronto, manufacturers of steam pipe and boiler coverings are contemplating the erection of a plant in Hamilton or Welland during the coming summer.

A million dollar wheat elevator is proposed to be erected on Deadman's Island, near Vancouver, by J. W. Weart, who has interested Vancouver, Winnipeg and San Francisco capital in his scheme.

The Keystone Engineering Co., Toronto, are contemplating locating at Wiarton. They state if satisfactory arrangements can be made they will employ from 150 to 500 men and pay $100,000 annually in wages.

Jess F. Hinck, secretary of the Farmers' Friend Scale Company, Minneapolis, Minn., has been in St. John for some days and is organizing a company to manufacture farm scales for which his company holds patents.

Samuel Shimer & Sons, Milton, Pa., manufacturers of cutter heads, have established a branch Canadian factory at Galt, Ont. They have purchased the building formerly occupied by St. Clair Bros., and expect to commence operation at once.

The E. B. Eddy Co., Hull, is erecting a new pump with a capacity of 3,500,000 imperial gallons every 24 hours. The new pump, with one already in operation, will afford a means of supplying six million gallons of water a day for washing pulp and feeding a smoke consumer.

The Canadian Antimony Co., of Lake George, York Co., N.B., intend re-opening their antimony mine and build a smelter at Lake George and branch railway to Harvey Station on the C.P.R. Ore was once mined there in paying quantities. The company askx exemption from royalties for twenty years.

The property of the Canada Radiator Company at Lachine has been sold by auction to the Asbestos Shingle, Slate and Sheeting Company, of Ambler, Penn., for $63,000. The area of the property is eight acres. The purchasers will at once erect a plant of their own to carry on their manufacturing operations in Canada. The company is also engaged in mining operations at Thetford.

The plant of the Montreal Paper Co., at Portneuf, Que., was damaged recently to the extent of $60,000, by the collapse of a large front wall of over 60 feet in length, and 30 feet high, which had been undermined by the overflow of water in the channel being excavated for the operation of a new turbine. All the machinery fell into the canal. The mill will be stopped for at least four months.

At the recent annual meeting of the Woodstock, Ont., Board of Trade, the secretary read a communication from the Russell Harvesting Machine Company, in which a plan was submitted for the erection of a large factory in that city. The citizens are asked to take up $25,000 of stock, and the company wants free light, water and taxes for ten years, or a free site. The company was recently organized to manufacture grain shockers.

The Acadia Cold Storage Co., Halifax, proposes to erect a plant there that will cost $300,000. The building will be five storeys, and it will have a frontage on three streets, and near the terminals where the ocean-going steamers stock. The building will be constructed of reinforced concrete, faced with buff brick, manufactured by the Mayhew Brick Co., of England. The outside walls and partitions will be insulated with granulated cork, manufactured by the Armstrong Cork Co., Montreal. The mechanical refrigerating plant will be installed by the Lindey British Refrigerating Co., of Canada. The company will install its own electrical plant, furnishing power and light, and the building will be fitted throughout with its own telephone system. Two large electric elevators will be installed, also a spiral chute running from the top to the bottom of the building. There is only one chute of this description east of San Francisco, and it is in one of the New York plants, it being a modern invention. The plant will be a modern one, and the capacity will be very large.

New Companies.

The Holden Co., Montreal; capital, $45,000; to manufacture railway apparatus. Incorporators, N. J. Holden, A. L. Deguire, L. L. Johnston, Montreal.

Smith Hardware Co., Montreal; capital, $20,000; to deal in hardware and cutlery. Incorporators, D. G. Smith, A. R. Hall and S. W. Jacobs, Montreal.

Montreal Wire-Bound Box Co., Montreal; capital, $100,000; to operate saw-mills. Incorporators, A. J. Brown, R. C. McMichael, R. O. McMurtry, Montreal.

H. W. Petrie, of Montreal; capital, $40,600; to manufacture machines and machinery supplies. Incorporators, W. Laurie, T. P. Altimas, M. A. Phelan, Montreal.

Diamonds & Gold, Ltd., Toronto; capital, $2,000,000; to treat ores, metals and minerals. Incorporators, W. D. Earngey, J. B. Hall, Toronto, and W. D. Hook, Ingersoll.

The Ling Asbestos Co., East Broughton, Que., capital, $200,000; to mine and manufacture asbestos. Incorporators, J. W. Cook, A. R. McMaster, A. A. Magee, Montreal.

The Kent Co., Montreal, capital, $50,000; to manufacture ice-making and refrigerating machinery. Incorporators, W. G. Kent, G. Darling, A. W. P. Buchanan, Montreal.

H. L. Bowers, Ltd., Port Hope; capital, $40,000; to manufacture building, foundry and sanitary supplies. Incorporators, H. T. Bush, A. E. Pipher, H. L. Bowers, Port Hope.

Epstein's Press Syndicate, Montreal; capital, $20,000; to do general printing, bookbinding and stereotyping business. Incorporators, L. Angevine, R. Cerash, C. J. Hirt, Montreal.

Canadian Calculators, Ottawa; capital, $20,000; to make computing and calculating machines for all purposes. Incorporators, F. J. Nicolas, G. F. Thompson and R. G. Code, Ottawa.

Rondeau Gas and Oil Co., Kingsville, Ont., capital, $100,000; to produce and refine natural gas and petroleum. Incorporators, S. L. McKay, B. Jasperson, Kingsville; L. G. Neely, St. Mary's, Ohio.

The Metallic Packing Co., Montreal; capital, $20,000; to manufacture and deal in electrical, mechanical and hydraulic machinery. Incorporators E. A. Barnard, C. L. Austin and A. B. Johnston, Montreal.

Whipple Horse Collar Co., Hamilton; capital, $100,000; to manufacture horse collars and saddlery hardware. Incorporators, J. D. Whipple, Hamilton and C. F. Scharmann and E. M. Browne, Omaha City, Neb.

Empire Fence Export Co., Walkerville; capital, $10,000; to manufacture wire, wire fencing and products of wire and iron, as well as machinery. Incorporators, M. Church, Detroit; J. W. Coatsworth, R. P. Hall, Walkerville.

The Belden Sheaf and Hay Loader Co., Palmerston, Ont.; capital, $150,000; to manufacture machines and implements for harvesting grain or hay. Incorporators, W. L. Holmes, Brussels; Geo. Howe, Palmerston, and W. R. Belden, Township of Grey.

Gas Items.

A gas plant proposition is talked of by the Lindsay Board of Trade.

The Acadia Gas Engine Co.'s factory at Bridgewater, N.S., is again working full time.

The B.C. Electric Co. contemplate erecting a large storeroom at the Gas Works, Victoria, to cost about $8,000.

The Calgary City Commissioners are considering the matter of assisting the Calgary Natural Gas Company to the extent of $10,000.

C. E. Dettman, Waynesburg, Pa., will start boring for oil and gas in the neighborhood of Peterboro' in a short time. This intelligence was given to the farmers from whom a lease has been secured of their property. It is mainly an experiment, although some are of the opinion that a find may be made.

James Fleming, proprietor of the Phoenix Foundry, St. John, who started manufacturing gasolene engines a couple of years ago, reports a growing demand for them and they have a very large number under way or finished and ready for shipment. The firm state that they have had more orders lately than they could fill. They find this branch of their business a most important one, giving employment to many hands and giving promise of expanding from year to year.

Trade Notes.

Wm. H. White has started to manufacture bungs, taps and spiles at Lachine, Que.

Frederick B. Stevens, Detroit, dealer in foundry supplies, is opening a warehouse in Toronto.

Peiler and MacKenzie, Montreal, have moved from 17 St. John street to suite 104, 52 St. James street.

The Manitoba Iron Works, Winnipeg, have secured the contract for all the transmission material for the Elk Lumber Co.'s new mill at Fernie.

The A. R. Williams Machinery Co. have securthe agency of the Alamo Manufacturing Co., Hillsdale, Mich., manufacturers of gas, gasoline and alcohol engines.

The Dominion Foundry Supply Co., 20 Pearl St., Toronto, are installing a No. 7 Whiting cupola in the Ontario Malleable Iron Co.'s plant, Oshawa, Ont.

The switchboard and panels for the new Y. M.C.A. building, Ottawa, are being supplied by the Hill Electric Switch & Mfg. Co., 1560 St. Lawrence St., Montreal.

Kellogg & Co., machinery merchants, have opened up an office at 196 King St. West, Toronto, and will handle metal and wood working machinery, power equipments and special machinery.

The Northern Electric and Manufacturing Co., Iberville, Que., have been awarded the contract for supplying and installing a western electric alternator, exciter and switchboard equipment for that town.

The Northern Electric & Manufacturing Co., have been awarded the contract for a Western Electric 260 k.w., 2,200-volt, 60-cycle, polyphase alternator and switchboard for the town of Macleod, Alberta.

The Schaake Machine Works, New Westminster, has completed its first consignment of twenty Johnston shingle machines which were ordered by the Davidson Ward Lumber Company for their mill at Loughborough Inlet.

The B. Greening Wire Co., Limited, Hamilton and Montreal, are installing electric welding machinery in their works for the more economical welding of the iron frames for their wire door mats, wire guards, tellers' cages, etc., and for the wire chain fittings and the welding of wire generally.

Jones & Glassco, 334 Notre Dame St., Montreal, report an order for twelve chain drives from The Wire & Cable Co. Mr. Hathaway while in England, investigated the application of chain drive and the orders are a result of his investigations. The J. R. Booth Lumber Co. placed an order for four 60 horse power Renold drives.

The following recent orders are reported by the Smart-Turner Machine Co., Hamilton: pumps from Technical School, Hamilton; City Bath House, Toronto; Collingwood Shipbuilding Co., Collingwood; steel tumbling barrel from Canada Screw Co., Hamilton; and two independent jet condensers from Doty Engine Works, Goderich.

The town of Edmonton, Alta., have recently ordered from the Robb Engineering Company, Amherst, two 600 H.P. Robb-Armstrong engines of the vertical enclosed high speed type for direct connection to electrical generators. Orders have also been received from the city of Calgary for one 750 k.w. vertical enclosed high speed type, three crank compound for direct connection to 500 k.w. electrical generator; from McLeod, Alta., two 120 h.p. Robb-Mumford internally fired boilers, and from Saskatoon, Sask., two 250 Robb-Mumford water tube boilers.

H. W. Petrie, of Montreal, Limited, have been incorporated to take over the business of H. W. Petrie, Limited, in Montreal, and Eastern Canada. This change is made with the view of benefitting the customers of the firm in the east who will now deal wholly with H. W. Petrie, of Montreal, Limited. Mr. Petrie, of H. W. Petrie, Limited, is the president of the new company, A. W. Rovan, vice-president and manager, T. P. Altimas, secretary-treasurer, and the entire staff of the old company has been retained.

A new corporation bearing the title The Cincinnati Bickford Tool Co., has been formed to acquire the business of the Bickford Drill and Tool Co. and of the Cincinnati Machine Tool Co. The capiatal stock is to consist of $350,000 of common and $150,000 of preferred stock. The new company is to build at once an entirely new plant at Oakley, the new manufacturing suburb of Cincinnati. August H. Tuechter, president of the Cincinnati Machine Tool Co. will be president of the new company. The other officers are Sherman C. Schauer, vice-president and general-manager; W. H. Shafer, secretary; G. P. Gradoff, treasurer, and H. M. Norris, Mechan. Eng.

Large Industry for Toronto.

A few months ago Canadian Machinery announced that the Standard Sanitary Mfg. Co., Pittsburg, were looking for a Canadian site. They have decided upon Toronto and will employ about 600 hands. This company is one of the largest manufacturers in America of bath tubes and all kinds of porcelain ware.

Welland, Ontario.

The City of Welland has a live Board of Trade who keep that city before the public. A booklet recently issued from the office of J. D. Boyne, Secy. Board of Trade, Welland, tells of the railway facilities, available power, etc. Two representatives of the Welland Board of Trade attended the National Tariff Convention held in Indianapolis in January, at which 1500 manufacturers were in attendance.

Cleveland Industrial Exposition.

Cleveland's Industrial Exposition, which will be held June 7th to 19th, promises to be unique in the history of home-product expositions in the diversity of manufactures shown. Among the exhibitions will be machinery, hardware, transportation, paints, oils, builders' supplies and similar sundries, the other to illumination and finely finished articles such as furniture, clothing, leather, printed matter, and numberless specialties and novelties.

Handsome Calendar.

The Allis-Chalmers-Bullock, Montreal, have issued a handsome hanger. Above a calendar is an interesting picture, "The First Engineers." This picture was designed for the Allis-Chalmers-Bullock Co., the original being painted by Arthur H. Hider, a well-known Canadian artist. It shows beavers at work and the theme is very appropriate as the Allis-Chalmers-Bullock Co. are also hydraulic engineers. The calendar is for twelve months dating from March 1909.

Time-Recorder Companies Amalgamate.

The International Time Recording Co., of Canada, and the Canadian Time Recording Co., both of Toronto, have amalgamated under the name of the International Time Recording Co. This company is now capitalized at $40,000 and the head office for Canada will be 19 Alice St., Toronto.

All kinds of time recorders will be manufactured in Canada so that customers may be supplied with either the domestic or imported articles. The following officers of the new company have been elected: Pres., H. W. Baifley, and M. D. Cranston, sec. and treas.

C.P.R. Shops for the West.

The conference of Canadian Pacific Railway officials on the question of train service in the West this summer was held in Winnipeg recently. The superintendent discussed improvements to be undertaken throughout the season. It is stated that the largest project under discussion by the railway officials are large and modernly equipped car building shops, which will form the nucleus of a plant that will ultimately turn out finished locomotives built from British Columbia iron and steel. The shops will be built on the line at Westminster Junction, about twenty miles from Vancouver. Operations will likely be started at once, so that freight cars will be ready for the western movement of grain next fall.

Contract for Lock Machinery.

The William Hamilton Co., Peterborough, have received a contract from the Railway and Canals Dept. of the Dominion Government for the supply of lock machinery for seventy-four locks.

It includes the supplying of all the operating machinery, anchorage fittings and pivots for twenty-four locks made up of the following: Two at Trenton, three at Glen Miller, one at Frankfort, five at Glen Ross, one at Raney Falls, one at Campbellford, three at Middle Falls, one at Healey's Falls, one at Hastings, one at Rosedale, one at Lindsay, three at Holland's Landing, and one at Newmarket. The contract amounts to about $100,000 with extras.

Railroad Development at Cochrane.

The Temiscaming and Northern Ontario Railway Commission have called for tenders for the following works:—

1. Engine house and machine shop at Cochrane. 2. Locomotive foreman's office and petty stores building at Cochrane. 3. Heating plant for Cochrane roundhouse and machine shop. 4. One 75 ft. turntable complete at Cochrane. 5. Coal shed and trestle at Cochrane. 6. Culvert near Mileage 22½. 7. 4 ft. arch culvert near Mileage 50¾. 8. 20 ft. I beam span near Mileage 62½. 9. 20 ft. re-inforced concrete arch culvert near Mileage 222½. 10. One 8 ft. re-enforced concrete arch culvert near Mileage 221. 11. One 11 ft. re-enforced concrete arch culvert near Mileage 218½.

Canadian Machine Tool Markets

VANCOUVER.

At a meeting of the C.P.R. superintendents held in Winnipeg, recently, the subject of new shops for British Columbia was discussed. If the plan goes through new car shops will be erected at Westminster Junction, a point 20 miles from Vancouver on the main line. It seems a feasible proposition for lumber from here is shipped to the car manufactories in Eastern Canada. Not only cars but locomotives are talked of, but these locomotives will be mostly for the lumber and logging industry. Many of these are used in this province, with the prospect of a good demand for years to come, since with the logging of areas close to the water, more power will be needed the further back timber is located.

General conditions are very encouraging. The lumber mills, both on the coast and in the interior, are starting up one after another, though in the territory east of the Cascades there are still a number of idle plants. Logs are going up in price, and a rise in the price of lumber is bound to come, for with the raw material at $9 and $16, rough lumber cannot be profitably sold at $12 and $13. An indication of the business in sight is shown by the large orders held by the Fraser River Lumber Company, at Fraser Mills on the Fraser river. These aggregate twelve million feet, over half of which is to be supplied to the G.T.P., the other firms in the contracts being the Rhodes Curry Company, of Amherst, N.S., the Ottawa Car Company, and dealers in the territory west of Regina.

WINNIPEG.

E. E. Sheppard, the manager in Winnipeg, for the Dominion Bridge Co., has been notified that this company intend expending $100,000 in increasing the output of their plant here. The present output is about four hundred tons per month. With the proposed extension this output will be about twelve hundred tons per month. The company, when the new plant is installed, will be able to carry about four thousand tons of raw material in stock. They are at present supplying the steel to the new union depot, and Nova Scotia bank, now under construction.

There is a decidedly hopeful outlook though trade generally is rather quiet at the present time. In some parts of the west, however, trade is much more brisk. There are prospects for some good business in power machinery and supplies. The cities appear to be the largest buyers of power equipments and many are planning the instalation of lighting plants during the coming summer.

TORONTO.

From the number of inquiries, one would judge that business in the machine, tool and foundry trades is entering a period of steady, substantial prosperity. The government trade returns and railroad receipts show increases over the corresponding period last year and there is a cheerful tone among the dealers and manufacturers, and there is every assurance of larger business in the coming months.

The foundry supply houses report an improvement in orders. There are prospects of a number of new foundries being erected and requiring complete equipment. The Standard Sanitary Mfg. Co., Pittsburg, has decided to erect a foundry and shops in Toronto for the manufacture of all kinds of sanitary ware.

MONTREAL.

There have been no developments during the past month that would point to an increased activity in the machine tool market, nor its allied lines, machinists' supplies and tool steel. In the former there are still small outbursts in some quarters that have the effect of making some one house very busy for the time being and, of course, this house reports an increase in the demand. These flashes in the pan may or may not be forerunners of permanent improvement. This remains to be determined.

If the market were qualified by the amount of tools on which prices have been figured it could be said that it is rapidly regaining normal strength, but unfortunately orders are placed for only a comparatively small amount of the tools on inquiry.

This time of the year is the best time for woodworking tools and the movement in these lines is quite brisk.

The tool steel situation is just steady and castings are moving very slowly.

CATALOGUES.

DRILL SOCKETS—Price list of "Use Em-Up" drill sockets from American Specialty Co., 1440 Monadnock Bldg., Chicago.

TWIN GAS HEATER—Pamphlet from L. S. Starrett Co., Athol, Mass., describing double tube gas heaters for tempering small tubes, melting babbit, etc., in the machine shop.

BLACKSMITH TOOLS—Catalogue 78 B, from Buffalo Forge Co., Buffalo, N.Y., of hand power and electric forges, stationary and portable in various types, tuyere irons, blacksmith's drills, etc.

TAPS AND DIES—From A. B. Jardine & Co., Hespeler, Ont., describing tube expanders, axle cutters, taps and dies, bolt threading and nut tapping machines, hand drilling machines, tire benders, etc.

SMALL TOOLS—Catalogue 16, from Standard Tool Co., Cleveland, O., 302 pages describing drills, reamers, taps, chucks, cutters, etc. Tables of standard screw threads, decimal equivalents, etc., are included, making it a very useful volume.

FRICTION CLUTCHES—From the Hill Clutch Co., Cleveland, Ohio, a booklet containing a reprint of a paper read before the annual meeting of the American Society of Mechanical Engineers, "Tests of Friction Clutches for Power Transmission."

BORING MACHINES—From Niles, Bement, Pond Co., 111 Broadway, New York, catalogue of deep hole drilling and rifling machine built at the Pratt & Whitney Works, Hartford, Conn. These include machines for drill and gun barrel drilling, and gun barrel grinders.

STEAM ENGINES—Catalogue from J. T. Schell, Alexandria, giving a full description of a new line of automatic engines being built for the Canadian market. They are known as the "Auto Climax" vertical high speed engines. The catalogue will be sent on receipt of address.

WIRE SCREENING—From the B. Greening Wire Co., Hamilton, 104 pages, illustrated, gives a brief history of the company and describes the heavy hard steel wire screening, wire cloth for locomotives, mining screens, threshing machines, fanning mills, etc., brass and copper wire cloth, perforated sheet, brass, zinc and steel. This is the first catalogue of a series of illustrated catalogues describing the products of the B. Greening Co. Tables of hard wire screening, decimals of wire and weight of finished article are given. Tables of mesh and weight of wire cloth are included from ¾ of an inch to 90 mesh together with the gauge of wire and the decimal size of opening. Copies of this valuable catalogue will be sent to readers of Canadian Machinery on request by sending the address and mentioning this paper. The other catalogue of the series will be mailed at an early date.

CANADIAN MACHINERY BUYERS' DIRECTORY

To Our Readers—Use this directory when seeking to buy any machinery or power equipment. You will often get information that will save you money.

To Our Advertisers—Send in your name for insertion under the heading of the lies you make or sell.

To Non-Advertisers—A nominal rate of $1 per line a year is charged non-advertisers.

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The Canadian Fairbanks Co., Montreal.
Canadian Hart Whee's Ltd., Hamilton.
Milroy-Harrison Co., Toronto.
H. W. Petrie, Toronto.
Carborundum Co., Niagara Falls, N.Y.
Stevens, F. B., Detroit, Mich.

Air Receivers.
Canadian Rand Co., Montreal.

Alloys.
Goldschmidt Thermit Co., Toronto
Hermann Boker & Co., Montreal

Anvils, Bench.
Ho'lands Mfg. Co., Erie, Pa.

Arbors.
Cleveland Twist Drill Co., Cleveland

Arbor Presses.
Niles-Bement-Pond Co., New York.

Automatic Machinery.
Gardner, Robt. & Son, Montreal
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National-Acme Mfg. Co., Cleveland

Axle Cutters.
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Babbit Metal.
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Barrels, Steel Shop.
Cleveland Wire Spring Co., Cleveland.

Barrels, Tumbling.
Detroit Foundry Supply Co., Windsor
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Hamilton Facing Mill Co., Hamilton.
Hyde, Francis & Co., Montreal
Falls Rivet & Machine Co., Cuyahoga Falls, Ohio
Northern Engineering Works, Detroit.
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Sheldons Limited, Galt
Sly, W. W., Mfg. Co., Cleveland
The Smart-Turner Mach. Co., Hamilton.
Whiting Foundry Equipment Co., Harvey, Ill.

Bars, Boring.
Hall Engineering Works, Montreal.
Niles-Bement-Pond Co., New York.

Bearings, Self-Oiling.
Wilson, J. C., & Co., Glenora, Ont.

Belt Tighteners.
Dodge Mfg. Co., Toronto

Belting, Chain.
Jeffrey Mfg. Co., Columbia, Ohio.
Milroy-Harrison Co., Toronto.
Waterous Engine Works Co., Brantford.

Belting, Cotton.
Dominion Belting Co., Hamilton.

Belting, Leather.
The Canadian Fairbanks Co., Montreal.
Milroy-Harrison Co., Toronto.
McLaren, J. C., Montreal.
H. W. Petrie, Toronto.
Sadler & Haworth, Montreal

Bending Machinery.
John Bertram & Sons Co., Dundas, Ont.
Bliss, E. W., Co., Brooklyn, N.Y.
Jardine, A. B. & Co., Hespeler, Ont.
London Mach. Tool Co., Hamilton, Ont.
National Machinery Co., Tiffin, Ohio.
Niles-Bement-Pond Co., New York.

Blowers.
Detroit Foundry Supply Co., Windsor
Dominion Foundry Supply Co., Toronto
Hamilton Facing Mill Co., Hamilton and Montreal.
Hyde, Francis & Co., Montreal
Monarch Eng. & Mfg. Co., Baltimore, Md
Sheldon's Limited, Galt.

Blast Gauges—Cupola.
Dominion Foundry Supply Co., Toronto
Hamilton Facing Mill Co., Hamilton
Sheldons, Limited, Galt

Boilers.
Berg Machinery Mfg. Co., Toronto
Goldie & McCulloch Co., Galt.
Mussens Limited, Montreal.
Owen Sound Iron Works Co., Owen Sound.
H. W. Petrie, Toronto.
The Smart-Turner Mach. Co., Hamilton.
Waterous Engine Works Co., Brantford.

Boiler Compounds.
Canada Chemical Mfg. Co., London, Ont.
Hall Engineering Works, Montreal.

Boiler Feed Regulators.
Standard Engineering Co., Toronto.

Boiler Makers' Supplies.
Allen, John F. New York

Boiler Mountings.
Standard Engineering Co., Toronto.

Bolt and Nut Machinery.
John Bertram & Sons Co., Dundas, Ont.
Gardner Robt. & Son, Montreal
London Mach. Tool Co., Hamilton.
Mussens Limited, Montreal.
National Machinery Co., Tiffin, Ohio.
Niles-Bement-Pond Co. New York.
Waterbury Farrell Foundry & Machine Co., Waterbury, Conn.

Bolt Cutters.
Mussens Limited, Montreal.

Boring Machines, Upright.
American Tool Works Co., Cincinnati.
John Bertram & Sons Co., Dundas, Ont.
London Mach. Tool Co., Hamilton.
Mussens Limited, Montreal.
Niles-Bement-Pond Co., New York.

Boring Machine, Wood.
Independent Pneumatic Tool Co., Chicago, Ill.
London Mach. Tool Co., Hamilton.
Mussens Limited, Montreal.

Boring and Turning Mills.
American Tool Works Co., Cincinnati.
John Bertram & Sons Co., Dundas, Ont.
Gisholt Machine Co., Madison, Wis.
London Mach. Tool Co., Hamilton.
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H. W. Petrie, Toronto.

Box Puller.
A. B. Jardine & Co., Hespeler, Ont.

Boxes, Steel Shop.
Cleveland Wire Spring Co., Cleveland.

Boxes, Tote.
Cleveland Wire Spring Co., Cleveland

Brake Shoes
Montreal Steel Works, Montreal

Brass Melting Furnaces.
Hamilton Facing Mill Co., Hamilton.
Monarch Eng & Mfg. Co., Baltimore,

Brass Working Machinery.
Gardner, Robt. & Son, Montreal
Mussens Limited Montreal.
Warner & Swasey Co., Cleveland, Ohio.

Brick Machinery
Berg Machinery Mfg. Co., Toronto

Brushes, Foundry and Core.
Detroit Foundry Supply Co., Windsor.
Dominion Foundry Supply Co., Toronto
Hamilton Facing Mill Co., Hamilton.
Hyde, Francis & Co., Montreal
Stevens, F. B., Detroit, Mich.

Buckets, Clam Shell.
Jeffrey Mfg. Co., Columbus,
Whiting Foundry Equipment Harvey, Ill.

Buckets, Crab.
Jeffrey Mfg. Co., Columbus, Ohio

Bulldozers.
John Bertram & Sons Co., Dundas, Ont.
London Mach. Tool Co., Hamilton, Ont
National Machinery Co., Tiffin, Ohio.
Niles-Bement-Pond Co., New York.

Burners, Core Oven.
Hamilton Facing Mill Co., Hamilton.
Monarch Eng. & Mfg. Co., Baltimore, Md

Burners, Fuel Oil.
Monarch Eng. & Mfg. Co., Baltimore, Md
Whiting Foundry Equipment Co., Harvey Ill.

Burners, Natural Gas.
Monarch Eng. & Mfg. Co., Baltimore, Md

Cables, Aerial and Underground.
Phillips, Eugene F., Electrical Works, Montreal
Waterous Engine Works Co., Brantford.

Canners' Machinery.
Bliss, E. W., Co., Brooklyn, N.Y.
Brown, Boggs Co. Hamilton
Jeffrey Mfg., Columbus, Ohio
Wilson, J. C., & Co., Glenora, Ont.

Car Replacers
Montreal Steel Works, Montreal

Car Wheels, Mine
Montreal Steel Works, Montreal

Cars, Factory & Warehouse.
Hammant Steel Car & Engineering Works, Hamilton Ont.
Sheldons Limited, Galt
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Cars, Foundry.
Detroit Foundry Supply Co., Windsor
Dominion Foundry Supply Co., Montreal
Hamilton Facing Mill Co., Hamilton.
Hammant Steel Car & Engineering Works, Hamilton Ont.
Hyde, Francis & Co. Montreal
Monarch Eng. & Mfg. Co., Baltimore, Md.
Sheldons Limited, Galt
Whiting Foundry Equipment Co., Harvey, Ill.

Cars, Industrial.
Mussens Limited, Montreal.
Whiting Foundry Equipment Co., Harvey, Ill.

Castings, Aluminum.
Lumen Bearing Co., Toronto
Stewart Machy Co Hammond, Ind.
Tallman, J. N., & Sons, Hamilton

Castings, Brass.
Chadwick Bros., Hamilton.
Wm Coulter & Sons, Toronto
Hall Engineering Works, Montreal.
Lumen Bearing Co., Toronto
Niagara Falls Machine & Foundry Co. Niagara Falls, Ont.
Owen Sound Iron Works Co., Owen Sound.
Stewart Machy Co., Hammond, Ind.
Tallman, J. N., & Sons, Hamilton
Waterous Engine Works Co., Brantford.
Wilson, J. C., & Co., Glenora, Ont.

Castings, Grey Iron.
Dodge Mfg. Co., Toronto
Gardner, Robt. & Son, Montreal
Hall Engineering Works, Montreal.
Katie Foundry Co., Galt. Ont
Niagara Falls Machine & Foundry Co., Niagara Falls, Ont
Owen Sound Iron Works Co., Owen Sound.
Smart-Turner Machine Co., Hamilton.
Stevens Co., Galt, Ont
Waterous Engine Works Co., Brantford.
Wilson, J. C., & Co., Glenora, Ont.

Castings, Gun Metal.
Stewart Machy Co., Hammond, Ind.

Castings, Manganese Steel
Montreal Steel Works, Montreal

Castings, Phosphor Bronze.
Lumen Bearing Co., Toronto
Stewart Machy Co., Hammond, Ind.

Castings, Semi-Steel.
Montreal Steel Works, Montreal

Cement Machinery.
Berg Machinery Mfg. Co., Toronto
Gardner. Robt. & Son, Montreal
Jeffrey Mfg. Co., Columbus, Ohio.
Owen Sound Iron Works Co., Owen Sound
Waterous Engine Works Co., Brantford.

Centreing Machines.
John Bertram & Sons Co., Dundas, Ont.
Gardner Robt. & Son, Montreal
Jeffrey Mfg Co., Columbia, Ohio
London Mach. Tool Co., Hamilton, Ont.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Hartford, Conn.

Centrifugal Pumps.
Pratt & Whitney Co., Hartford, Conn.
Waterous Engine Works Co., Brantford

Chain Blocks.
Mussens Limited, Montreal.

Charcoal.
Detroit Foundry Supply Co., Windsor.
Dominion Foundry Supply Co., Toronto
Hamilton Facing Mill Co., Hamilton.
Hyde, Francis & Co., Montreal
Stevens, F. B., Detroit. Mich.

Chemicals.
Canada Chemical Co., London.

Chucks, Brass Finishers.
E Horton & Son Co., Windsor Locks, Conn.
Skinner Chuck Co., New Britain, Conn

Chucks, Combination.
E Horton & Son Co., Windsor Locks, Conn
Skinner Chuck Co., New Britain, Conn

Chucks, Cutting-off.
E Horton & Son Co., Windsor Locks, Conn
Skinner Chuck Co., New Britain, Conn

Chucks, Drill and Lathe.
American Tool Works Co., Cincinnati.
John Bertram & Sons Co., Dundas, Ont.
Cleveland Twist Drill Co., Cleveland
Cushman Chuck Co., Hartford, Conn
Gardner, Robt. & Son, Montreal
Hamilton Tool Co., Hamilton, Ont.
E Horton & Son Co., Windsor Locks, Conn
Ker & Goodwin, Brantford.
London Mach. Tool Co., Hamilton.
Milroy-Harrison Co., Toronto.
Mussens Limited, Montreal.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.
Skinner Chuck Co., New Britain, Conn
Standard Tool Co., Cleveland.

Chucks, Grinding Machine.
E Horton & Son Co., Windsor Locks, Conn
Skinner Chuck Co., New Britain, Conn

Chucks, Independent Jaw.
E Horton & Son Co., Windsor Locks, Conn.
Skinner Chuck Co., New Britain, Conn

Chucks (Planer or Milling.)
Gardner, Robt. & Son, Montreal
Holland's Mfg. Co., Erie. Pa.
E Horton & Son Co., Windsor Locks, Conn
Skinner Chuck Co, New Britain, Conn

Chucks, Screw Machine.
E Horton & Son Co., Windsor Locks, Conn
Skinner Chuck Co, New Britain, Conn

Chucking Machines.
American Tool Works Co., Cincinnati.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.
Warner & Swasey Co, Cleveland, Ohio

Chucks, Universal.
E Horton & Son Co, Windsor Locks, Conn
Skinner Chuck Co, New Britain, Conn

Circuit Breakers.
Canadian Westinghouse Co., Hamilton.
Gas & Electric Power Co., Toronto.

Cloth and Wool Dryers.
B. Greening Wire Co., Hamilton.
Sheldons Limited, Galt

Coal Boring Machines.
Cumming, J. W., New Glasgow, N.S.

Coal Handling Machinery.
Jeffrey Mfg. Co., Columbus, Ohio
Waterous Engine Works Co., Brantford

Coal Miners' Tools.
Cumming, J. W., New Glasgow, N.S.

Collars.
Dodge Mfg. Co., Toronto

Collectors, Pneumatic.
Sheldons Limited, Galt

Compressors, Air.
Canadian Rand Co., Montreal.
Canadian Westinghouse Co., Hamilton.
Darling Bros., Ltd., Montreal
Hall Engineering Works, Montreal, Que.
Independent Pneumatic Tool Co., Chicago.
H. W. Petrie, Toronto.
Monarch Eng. & Mfg. Co., Baltimore, Md.
Mussens Limited, Montreal.
Niles-Bement-Pond Co., New York.
The Smart-Turner Mach. Co., Hamilton.

Concentrating Plant.
Gardner, Robt. & Son, Montreal

Concrete Mixers.
Jeffrey Mfg. Co., Columbus, Ohio.

Condensers.
Goldie & McCulloch Co., Galt.
Hall Engineering Works, Montreal.
Smart-Turner Machine Co., Hamilton.
Waterous Engine Co., Brantford.

Consulting Engineers.
Bain & Mitchell, Montreal
Connor, A. W., Toronto
Death & Watson, Toronto
Fensom, C. J., Toronto
Hall Engineering Works, Montreal.
Robertson, J. M., Ltd., Montreal
Roderick J. Parke, Toronto.
T. Pringle & Son, Montreal.

Contractors' Plant.
Niagara Falls Machine & Foundry Co., Niagara Falls, Ont.

Controllers and Starters Electric Motor.
Canadian Westinghouse Co., Hamilton.
T. & H. Electric Co., Hamilton.

Conveyor Machinery.
Dodge Mfg. Co., Toronto
Goldie & McCulloch Co., Galt
Jeffrey Mfg. Co., Columbus, Ohio.
Laurie Engine & Machine Co., Montreal.
Mussens Limited, Montreal.
Smart-Turner Machine Co., Hamilton.
Waterous Engine Works Co., Brantford.
Wilson, J. C., & Co., Glenora, Ont.

Coping Machines.
John Bertram & Sons Co., Dundas, Ont.
London Mach. Tool Co., Hamilton.
Niles-Bement-Pond Co., New York.

Corundum and Corundum Wheels.
Canadian Hart Wheels Ltd., Hamilton

Core Box Machines.
Fox Machine Co., Grand Rapids.

Core Cutting-off and Coning Machine.
Falls Rivet & Machine Co., Cuyahoga Falls, Ohio.
Hamilton Facing Mill Co., Hamilton.

Core Compounds.
Buffalo Foundry Supply Co., Buffalo.
Detroit Foundry Supply Co., Windsor.
Dominion Foundry Supply Co., Toronto
Hamilton Facing Mill Co., Hamilton.
Hyde, Francis & Co., Montreal
Stevens, F. B., Detroit, Mich.

Core-Making Machines.
Falls Rivet & Machine Co., Cuyahoga Falls, Ohio.
Hamilton Facing Mill Co., Hamilton.
Hyde, Francis & Co., Montreal
Stevens, F. B., Detroit, Mich.

Core Ovens.
Detroit Foundry Supply Co., Windsor.
Dominion Foundry Supply Co., Montreal
Falls Rivet & Machine Co., Cuyahoga Falls, Ohio.
Hamilton Facing Mill Co., Hamilton and Montreal.
Hyde, Francis & Co., Montreal
Sheldons Limited, Galt
Stevens, F. B., Detroit, Mich.
Whiting Foundry Equipment Co., Harvey, Ill.

Core Prints—Standard.
Falls Rivet & Machine Co., Cuyahoga Falls, Ohio.
Hamilton Facing Mill Co., Hamilton.

Core Sand Cleaners.
Sly, W. W., Mfg. Co., Cleveland

Couplings.
Dodge Mfg. Co., Toronto
Gardner, Robt. & Son, Montreal
Owen Sound Iron Works Co., Owen Sound
Wilson, J. C., & Co., Glenora, Ont.

Couplings, Air.
Canadian Rand Co., Montreal.
Independent Pneumatic Tool Co., Chicago

Cranes, Electric and Hand Power.
Advance Machine Works, Walkerville, Ont.
Canadian Rand Co., Montreal.
Dominion Foundry Supply Co., Montreal
Gardner, Robt. & Son, Montreal
Hamilton Facing Mill Co., Hamilton.
Milroy-Harrison Co., Toronto
Mussens Limited, Montreal.
Niles-Bement-Pond Co., New York.
Northern Engineering Works, Detroit
Owen Sound Iron Works Co., Owen Sound
Smart-Turner-Machine Co., Hamilton.
Whiting Foundry Equipment Co., Harvey, Ill.

Cranes, Hydraulic.
Whiting Foundry Equipment Co., Harvey, Ill.

Crank Pin Turning Machine.
London Mach. Tool Co., Hamilton.
Niles-Bement-Pond Co., New York.

Crossings, Diamond Rail
Montreal Steel Works, Montreal

Crucibles.
Detroit Foundry Supply Co., Windsor
Dominion Foundry Supply Co., Montreal
Goldschmidt Thermit Co., Toronto
Hamilton Facing Mill Co., Hamilton.
Hyde, Francis & Co., Montreal
Siedel, R. B., Inc., Philadelphia
Stevens, F. B., Detroit, Mich.

Crushers, Rock or Ore.
Jeffrey Mfg. Co., Columbus, Ohio.
Waterous Engine Works Co., Brantford.

Cupolas.
Advance Machine Works, Walkerville, Ont.
Detroit Foundry Supply Co., Windsor
Dominion Foundry Supply Co., Montreal
Hamilton Facing Mill Co., Hamilton.
Hyde, Francis & Co., Montreal
Northern Engineering Works, Detroit
Sheldons Limited, Galt.
Whiting Foundry Equipment Co., Harvey, Ill.

Cupola Blast Gauges.
Dominion Foundry Supply Co., Montreal
Hamilton Facing Mill Co., Hamilton.
Sheldons Limited, Galt

Cupola Blocks.
Detroit Foundry Supply Co., Detroit.
Dominion Foundry Supply Co., Toronto
Hamilton Facing Mill Co., Hamilton
Hyde, Francis & Co., Montreal
Northern Engineering Works, Detroit
Ontario Lime Association, Toronto

Cupola Blowers.
Detroit Foundry Supply Co., Windsor
Dominion Foundry Supply Co., Toronto
Hamilton Facing Mill Co., Hamilton.
Hyde, Francis & Co., Montreal
Northern Engineering Works, Detroit
Sheldon's Limited, Galt.

Cupola Linings.
Hamilton Facing Mill Co., Hamilton.
Stevens, F. B., Detroit, Mich.

Cutters, Flue.
Independent Pneumatic Tool Co., Chicago, Ill.

Cutters, Gear.
Milroy-Harrison Co., Toronto.

Cutters, Pipe.
Hollands Mfg. Co., Erie, Pa.

Cutter Grinder Attachment
Cincinnati Milling Machine Co., Cincinnati

Cutter Grinders.
Cincinnati Milling Machine Co., Cincinnati

Cutters, Milling.
Abbott, Wm., Montreal
Becker Milling Machine Co., Hyde Park, Mass.
Cleveland Twist Drill Co., Cleveland
Hamilton Tool Co., Hamilton, Ont.
Milroy-Harrison Co., Toronto.
Mussens Limited, Montreal.
Pratt & Whitney Co., Hartford, Conn.
Standard Tool Co., Cleveland.

Cutting-off Machines.
Armstrong Bros., Tool Co., Chicago
John Bertram & Sons Co., Dundas, Ont.
London Mach. Tool Co., Hamilton.
Mussens Limited, Montreal.
H. W. Petrie, Toronto.
Pratt & Whitney Co., Hartford, Conn.

Cutting-off Tools.
Armstrong Bros. Tool Co., Chicago.
London Mach. Tool Co., Hamilton.
H. W. Petrie, Toronto.
Pratt & Whitney, Hartford, Conn.
L. S. Starrett Co., Athol, Mass.

Damper Regulators.
Darling Bros., Ltd., Montreal

Dies.
Acme Stamping & Tool Co., Hamilton
Armstrong Bros., Toronto
Banfield, W. H. & Son, Toronto
Bliss, E. W., Co., Brooklyn, N.Y.
Fisher, A. D., Co., Toronto
Gardner, Robt. & Son, Montreal
Hall, Jas. B., Toronto
Hollands Mfg. Co., Erie, Pa.
Scott, Ernest, Montreal.
Standard Contracting Co., Toronto.
Stevens Co., Galt

Die-Making Machinery.
Stevens Co., Galt, Ont.

Die Stocks.
Canadian Tap & Die Co., Galt
Curtis & Curtis Co., Bridgeport, Conn.
Jardine, A. B., & Co., Hespeler, Ont.
Milroy-Harrison Co., Toronto.

Dies, Opening.
W. H. Banfield & Sons, Toronto
Jardine, A. B., & Co., Hespeler, Ont.
Pratt & Whitney Co., Hartford, Conn.

Dies, Threading.
Jardine, A. B., & Co., Hespeler, Ont.
Milroy-Harrison Co., Toronto.

Draft, Mechanical.
W. H. Banfield & Sons, Toronto.
Butterfield & Co., Rock Island, Que.
A. B. Jardine & Co., Hespeler
Pratt & Whitney Co., Hartford, Conn.
Sheldon's Limited, Galt.

Drawn Steel, Cold.
Union Drawn Steel Co., Hamilton.

Drilling Machines, Horizontal.
John Bertram & Sons Co., Dundas, Ont
London Mach. Tool Co., Hamilton.
Mussens Limited, Montreal
Niles-Bement-Pond Co., New York.

Drilling Machines, Locomotive.
American Tool Works Co., Cincinnati.
John Bertram & Sons Co., Dundas, Ont.
The Canadian Fairbanks Co., Montreal.
A. B. Jardine & Co., Hespeler, Ont.
London Mach. Tool Co., Hamilton, Ont.
Mussens Limited, Montreal.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.
Williams & Wilson, Montreal

Drilling Machines, Multiple Spindle.
American Tool Works Co., Cincinnati.
John Bertram & Sons Co., Dundas, Ont.
London Mach. Tool Co., Hamilton, Ont
Mussens Limited, Montreal.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.
Williams & Wilson, Montreal.

Drilling Machines, Radial.
American Tool Works Co., Cincinnati.
The Canadian Fairbanks Co., Montreal.
London Mach. Tool Co., Hamilton.
Mussens Limited, Montreal.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.

Drilling Machines, Turret.
John Bertram & Sons Co. Dundas, Ont
London Mach. Tool Co., Hamilton.
Niles-Bement-Pond Co., New York.

Drilling Machines, Upright.
American Tool Works Co., Cincinnati.
Bawden Machine & Tool Co., Toronto.
John Bertram & Sons Co., Dundas, Ont.
Fox Machine Co., Grand Rapids.
Hamilton Tool Co., Hamilton, Ont.
A. B. Jardine & Co., Hespeler, Ont.
London Mach. Tool Co., Hamilton.
Mussens Limited, Montreal.

Drills, Bench.
Fisher, A. D., Co., Toronto
Hamilton Tool Co., Hamilton, Ont.
London Mach. Tool Co., Hamilton.
Pratt & Whitney Co., Hartford, Conn.

Drills, Blacksmith.
American Specialty Co., Chicago
A. B. Jardine & Co., Hespeler, Ont.
London Mach. Tool Co., Hamilton.
Standard Tool Co., Cleveland.

Drills, Centre.
Cleveland Twist Drill Co., Cleveland
Milroy Harrison Co., Toronto
Pratt & Whitney Co., Hartford, Conn.
Standard Tool Co., Cleveland, O.
L. S. Starrett Co., Athol, Mass.

Drills, Coal and Plaster.
Cumming, J. W., New Glasgow, N.S.

Drills, Electric.
Fisher A. D., Co., Toronto
Mussens Limited, Montreal.
Niles-Bement-Pond Co., New York.

Drills, High Speed.
American Specialty Co., Chicago
Abbott, Wm., Montreal
Hermann Boker & Co., Montreal
Cleveland Twist Drill Co., Cleveland
Alexander Gibb, Montreal.
Lincoln-Williams Twist Drill Co., Taunton, Mass.
Milroy-Harrison Co., Toronto.
Mussens Limited, Montreal.
Pratt & Whitney Co., Hartford, Conn.
Standard Tool Co., Cleveland, O.

Drills, Hand.
A. B. Jardine & Co., Hespeler, Ont.

Drills, Pneumatic.
Allen, John F., New York
Canadian Rand Co., Montreal
Independent Pneumatic Tool Co., Chicago, New York
Mussens Limited, Montreal.
Niles-Bement-Pond Co., New York.

Drills, Ratchet.
Armstrong Bros. Tool Co., Chicago.
Cleveland Twist Drill Co., Cleveland
A. B. Jardine & Co., Hespeler.
Milroy-Harrison Co., Toronto.
Pratt & Whitney Co., Hartford, Conn.
Standard Tool Co., Cleveland.

Drills, Rock.
Canadian Rand Drill Co., Montreal.
Jeffrey Mfg. Co., Columbus, Ohio.

Drills, Sensitive.
American Tool Works Co., Cincinnati.
Fisher A. D., Co., Toronto
Fox Machine Co., Grand Rapids
McKenzie, D., Guelph, Ont.
Mussens Limited, Montreal.
Niles-Bement-Pond Co., New York

Drills, Track.
American Specialty Co., Chicago

Drills, Twist.
American Specialty Co., Chicago
Abbott, Wm., Montreal.
Hermann Boker & Co., Montreal
Cleveland Twist Drill Co., Cleveland
Alex. Gibb, Montreal.
Lincoln-Williams Twist Drill Co., Taunton, Mass.
Milroy-Harrison Co., Toronto.
Morse Twist Drill and Machine Co., New Bedford, Mass.
Mussens Limited, Montreal.
Pratt & Whitney Co., Hartford, Conn.
Standard Tool Co., Cleveland.

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American Specialty Co., Chicago
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Hammant Steel Car and Eng. Works, Hamilton.
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Koppel, Arthur Co., New York
Niles-Bement-Pond Co., New York.
Owen Sound Iron Works Co., Owen Sound
Waterous Engine Co., Brantford.

Dust Arresters.
Sly, W. W., Mfg. Co., Cleveland

Dynamos.
Canadian Westinghouse Co., Hamilton.
Hall Engineering Works, Montreal, Que.
Packard Electric Co., St. Catharines.
H. W. Petrie, Toronto.
T. & H. Electric Co., Hamilton.

Electrical Books.
American Industrial Pub. Co., Bridgeport, Conn.

Electrical Pyrometers.
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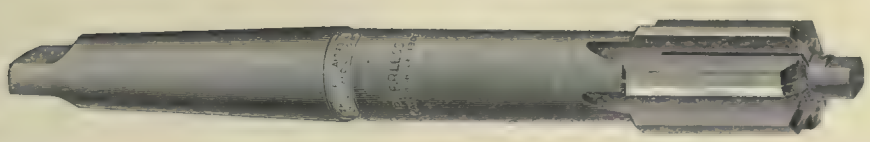

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Milroy-Harrison Co., Toronto.
H. W. Petrie, Toronto.
Standard Tool Co., Cleveland.

Engineering Books.

American Industrial Pub. Co., Bridgeport, Conn.

Engineers and Contractors.

Bain & Mitchell, Montreal
Darling Bros., Ltd., Montreal
Goldie & McCulloch Co., Galt, Ont.
Hall Engineering Works, Montreal.
The Smart-Turner Mach. Co., Hamilton.
Waterous Engine Works Co., Brantford

Engineers' Supplies.

Hall Engineering Works, Montreal.

Engines, Corless.

Berg Machinery Mfg. Co., Toronto

Engines, Gas and Gasolene.

The Canadian Fairbanks Co., Montreal.
Goldie & McCulloch Co., Galt, Ont.
Independent Pneumatic Tool Co., Chicago Ill.
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Milroy-Harrison Co., Toronto.
Oliver, W. H., & Co., Toronto
H. W. Petrie, Toronto.
The Smart-Turner Mach. Co., Hamilton

Engines, Oil.

Jones & Glassco, Montreal

Engines, Steam.

Bellias & Marcom, Birmingham, Eng.
The Goldie & McCulloch Co., Galt, Ont.
Sheldons Limited, Galt.
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Waterous Engine Works Co., Brantford.

Excavating Machinery.

Jeffrey Mfg. Co., Columbus, Ohio

Exhaust Heads.

Darling Bros., Ltd., Montreal.
Sheldons Limited, Galt, Ont.
Standard Engineering Co., Toronto.

Fans, Electric.

Canadian Westinghouse Co., Hamilton.
Fisher, A. D., Co., Toronto
Sheldons Limited, Galt, Ont.
The Smart-Turner Mach. Co., Hamilton.

Fans, Exhaust.

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Dominion Foundry Supply Co., Toronto
Hamilton Facing Mill Co., Hamilton.
Sheldons Limited, Galt.

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The Smart-Turner Mach. Co., Hamilton
Waterous Engine Works Co., Brantford.

Fillers (Metallic.)

Smooth-On Mfg. Co., Jersey City, N.J.
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Fillets, Leather & Wooden

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Fire Brick and Clay.

Detroit Foundry Supply Co., Windsor.
Dominion Foundry Supply Co., Toronto
Hyde, Francis & Co., Montreal.
Hayes Run Fire Brick Co., Orvis, Pa.
Hamilton Facing Mill Co., Hamilton
Ontario Lime Association, Toronto
Penn, Wm., Silica Works, Philadelphia.
Stevens, F. B., Detroit, Mich.

Forges.

Hamilton Facing Mill Co., Hamilton.
Independent Pneumatic Tool Co., Chicago, Ill.
Monarch Eng. Mfg. Co., Baltimore, Md.
H. W. Petrie, Toronto.
Sheldons Limited, Galt, Ont.

Forges, Oil Rivet.

Monarch Eng & Mfg. Co., Baltimore, Md

Forgings, Drop.

Bliss, E. W., Co., Brooklyn, N.Y.
H. W. Petrie, Toronto.
Wilson, J. C., & Co, Glenora, Ont.

Forgings, Light & Heavy.

Hamilton Steel & Iron Co., Hamilton

Forging Machinery.

John Bertram & Sons Co., Dundas, Ont.
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London Mach. Tool Co., Hamilton, Ont
National Machinery Co., Tiffin, Ohio
Niles-Bement-Pond Co., New York.

Foundry Coke.

Baird & West, Detroit
Stevens, F. B., Detroit, Mich.

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Hyde, Francis & Co., Montreal
Northern Engineering Works, Detroit
Stevens, F. B., Detroit, Mich.
Whiting Foundry Equipment Co., Harvey, Ill.

Foundry Parting.

Dominion Foundry Supply Co., Toronto
Foundry Specialty Co., Cincinnati.
Hyde, Francis & Co., Montreal
Swobodda, L. J., New York.

Foundry Facings.

Detroit Foundry Supply Co., Windsor.
Dominion Foundry Supply Co., Toronto
Hamilton Facing Mill Co., Hamilton.
Hyde, Francis & Co. Montreal
Stevens, F. B., Detroit, Mich.

Friction Clutches.

Dodge, Mfg. Co., Toronto

Friction Clutch Pulleys, etc

The Goldie & McCulloch Co., Galt.
Waterous Engine Works Co., Brantford.

Frogs

Montreal Steel Works, Montreal

Furnace Lining.

Monarch Eng. & Mfg. Co., Baltimore, Md

Furnaces.

Detroit Foundry Supply Co., Windsor.
Dominion Foundry Supply Co., Montreal
Hamilton Facing Mill Co., Hamilton.
Hyde, Francis & Co., Montreal
Monarch Eng. & Mfg. Co., Baltimore
Northern Engineering Works, Detroit
Stevens, F. B., Detroit, Mich.
Whiting Foundry Equipment Co., Harvey, Ill.

Furnaces, Brass.

Monarch Eng. & Mfg. Co., Baltimore, Md
Whiting Foundry Equipment Co., Harvey, Ill.

Gang Planer Tools.

Armstrong Bros. Tool Co., Chicago

Gas Blowers and Exhausters.

Sheldons Limited, Galt.

Gas Producer Plants.

Bain & Mitchell, Montreal
Gas & Electric Power Co., Toronto
Oliver, W. H. & Co. Toronto.
Jones & Glassco, Montreal

Gauges, Standard.

Cleveland Twist Drill Co., Cleveland
Pratt & Whitney Co., Hartford, Conn

Gear-Cutting Machinery.

Armstrong Bros., Toronto
Becker Milling Mach. Co., Hyde Park, Mass.
London Mach. Tool Co., Hamilton.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.
Pratt & Whitney Co., Hartford, Conn.
Wilson, J. C., & Co., Glenora, Ont.

Gears, Angle.

Boston Gear Works Norfolk Downs, Mass.
Gardner, Robt. & Son, Montreal
Goldie & McCulloch Co., Galt, Ont.
Waterous Engine Co., Brantford.
Wilson, J. C., & Co., Glenora, Ont.

Gears, Cut.

Boston Gear Works, Norfolk Downs, Mass
Gardner, Robt. & Son, Montreal
Goldie & McCulloch Co., Galt, Ont.
Horsburgh & Scott Co., Cleveland

New Process Raw-Hide Co., Syracuse, N.Y.
Wilson, J. C., & Co., Glenora, Ont.

Gears, Mortise.

Boston Gear Works, Norfolk Downs, Mass.
Gardner, Robt. & Son, Montreal
Goldie & McCulloch Co., Galt, Ont.
New Process Raw-Hide Co., Syracuse, N.Y.
Waterous Engine Works Co., Brantford.
Wilson, J. C., & Co., Glenora, Ont.

Gears, Rawhide.

Gardner Robt., & Son, Montreal
Goldie & McCulloch Co., Galt, Ont.
Horsburgh & Scott Co., Cleveland
New Process Raw-Hide Co., Syracuse, N.Y.
Waterous Engine Works Co., Brantford.

Gears, Worm.

Gardner Robt., & Son, Montreal
Horsburgh & Scott Co., Cleveland
Wilson, J. C., & Co., Glenora, Ont.

Generators, Electric.

Canadian Westinghouse Co., Hamilton.
Gas & Electric Power Co., Toronto
Hall Engineering Works, Montreal.
H. W. Petrie, Toronto.
Toronto & Hamilton Electric Co. Hamilton.

Governors, Water Wheel.

Wilson, J. C., & Co., Glenora, Ont.

Graphite.

Detroit Foundry Supply Co., Windsor.
Dominion Foundry Supply Co., Toronto
Hamilton Facing Mill Co., Hamilton.
Stevens, F. B., Detroit, Mich.

Grease Cups.

Peterboro Lubricator Mfg. Co., Peterboro, Ont.

Grinders, Automatic Knife.

Canadian Hart Wheels Ltd., Hamilton.
W. H. Banfield & Son, Toronto.
Waterous Engine Works Co., Brantford.

Grinders, Bench.

Canadian Hart Wheels Ltd., Hamilton.
McKenzie, D., Guelph, Ont.
Hall, J. H., & Sons, Brantford.

Grinders, Centre.

Canadian Hart Wheels Ltd., Hamilton.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.

Grinders, Cutter.

Becker Milling Mach. Co., Hyde Park Mass.
Pratt & Whitney Co., Hartford, Conn.

Grinders, Disc.

Armstrong Bros. Co., Chicago

Grinders, Tool.

Armstrong Bros. Tool Co., Chicago.
Blount, J. G., & Co., Everett, Mass.
Canadian Hart Wheels Ltd., Hamilton.
Gisholt Machine Co. Madison, Wis.
H. W. Petrie, Toronto.

Grinders, Pedestal.

Canadian Hart Wheels Ltd., Hamilton,
Hall, J. H., & Sons, Brantford.

Grinding Holders.

Armstrong Bros. Tool Co., Chicago

Grinding Machines.

Canadian Hart Wheels Ltd., Hamilton.
Fisher, A. D., Co., Toronto
The Canadian Fairbanks, Montreal.
Gardner Robt., & Son, Montreal
Independent Pneumatic Tool Co., Chicago, Ill.
Milroy-Harrison Co., Toronto.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.

Grinding Machines, Portable, Pneumatic

Independent Pneumatic Tool Co., Chicago.

Grinding and Polishing Machines.

Fisher, A. D. Co., Toronto
Gardner, Robt., & Son, Montreal

Grinding Wheels.

Canadian Hart Wheels Ltd., Hamilton.
Carborundum Co., Niagara Falls
Mussens Limited, Montreal.
Milroy-Harrison Co., Toronto.

Hack Saws.

Hermann Boker & Co., Montreal
The Canadian Fairbanks Co., Montreal.
Milroy-Harrison Co., Toronto.
McKenzie D., Guelph, Ont.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.

Hack Saw Frames.

Millers Falls Co., New York.
Mussens Limited, Montreal.

Hammers, Belt Driven.

Beaudry & Co., Inc., Boston

Hammers, Drop.

Bliss, E. W., Co., Brooklyn, N.Y.
London Mach. Tool Co., Hamilton, Ont.
Niles-Bement-Pond Co., New York.

Hammers, Pneumatic

Independent Pneumatic Tool Co., Chicago.

Hammers, Power.

Beaudry & Co., Boston, Mass.

Hammers, Steam.

Beaudry & Co., Inc., Boston
John Bertram & Sons Co. Dundas, Ont.
London Mach. Tool Co., Hamilton, Ont.
Mussens Limited, Montreal.
Niles-Bement-Pond Co., New York.

Hammers, Trip.

Beaudry & Co., Inc., Boston

Hand Hoists & Trolleys.

Beath, W. D., & Son, Toronto

Hangers.

Dodge Mfg. Co., Toronto
Fay, J. A. & Egan Co., Cincinnati
Gardner Robt. & Son, Montreal
The Goldie & McCulloch Co., Galt.
Owen Sound Iron Works Co., Owen Sound
The Smart-Turner Mach. Co., Hamilton.
Waterous Engine Co., Brantford.
Wilson, J. C., & Co., Glenora, Ont.

Heating Apparatus.

Darling Bros., Ltd., Montreal
Sheldons Limited, Galt.

Hoisting and Conveying Machinery.

Goldie & McCulloch Co., Galt, Ont.
Jeffrey Mfg. Co., Columbus, Ohio.
Niles-Bement-Pond Co., New York.
Northern Engineering Works, Detroit
The Smart-Turner Mach. Co., Hamilton.
Waterous Engine Co., Brantford.
Wilson, J. C., & Co., Glenora, Ont.

Hoists, Electric.

Beath W. D., & Son, Toronto
Northern Engineering Works, Detroit
Whiting Foundry Equipment Co., Harvey, Ill.

Hoists, Pneumatic.

Canadian Rand Co., Montreal.
Dominion Foundry Supply Co., Montreal
Hamilton Facing Mill Co., Hamilton.
Independent Pneumatic Tool Co., Chicago.
Mussens Limited, Montreal
Northern Engineering Works, Detroit
Whiting Foundry Equipment Co. Harvey, Ill.

Hose, Air.

Canadian Rand Co., Montreal.
Canadian Westinghouse Co., Hamilton.
Independent Pneumatic Tool Co., Chicago

Hose, Steam.

Canadian Rand Co., Montreal.
Canadian Westinghouse Co., Hamilton.
Independent Pneumatic Tool Co., Chicago, Ill.

Hydraulic Accumulators.

Niles-Bement-Pond Co., New York.
The Smart-Turner Mach. Co., Hamilton.

Hydraulic Machinery.

Wilson, J. C., & Co., Glenora, Ont.

Index Centres.

Stockbridge Machine Co, Worcester Mass.

Indicators, Speed.

L. S. Starrett Co., Athol, Mass.

Interlocking Plants and Signals

Montreal Steel Works, Montreal

Intersections, Railway

Montreal Steel Works, Montreal

Iron Cements.

Milroy-Harrison Co., Toronto.

The Process of the Destructive Distillation of Wood

New Plant at Donald, Ont., of Wood Products Co.—The Process of Manufacture, Buildings and Power Equipment—Instalation of Warren Gas Engine and Producer Gas Plant, using Charcoal Braise as Fuel.

The new plant recently completed at Donald, Ont., for the destructive distillation of wood, possesses some unique features of building construction, power plant and equipment that make it of general interest.

Donald is a small town on the G.T.R., north of Lindsay in Haliburton county, consisting of the cottages, store, hotel and works of the Wood Products Co. Fig. 1 is a general view of the works and Fig. 2 shows the general layout. In this plant a log of wood is transformed into block charcoal, wood alcohol, acetate of lime and tar, for strange as it may seem, these products are all contained in any good log of hardwood. The separating of them involves great expense, intricate mechanical equipment and a wealth of skilled labor.

The primary purpose of the factory is the production of charcoal. The raw material used is hardwood. The wood is obtained in the large limits around Donald and several camps of wood choppers are kept employed continuously, the plant requiring about 50 cords daily.

The wood is piled in the yards as shown in Fig. 1. From there it is taken to the oven house shown in Fig. 2, and it is here that the process begins. The cord wood is loaded in 24 cars, each holding two cords, and three of these cars are rolled into each oven. In these ovens, the temperature is kept constant at about 750 degrees F. This intense heat necessary to bring about this temperature is generated beneath the level of the ground, and under firebrick arches, the fuel consisting of mill refuse and wood gas. The cars are run into the ovens, the doors are hermetically sealed and the baking process begins. After being subjected to this heat for about eight hours, the gases begin to form and the wood undergoes a distinct chemical change.

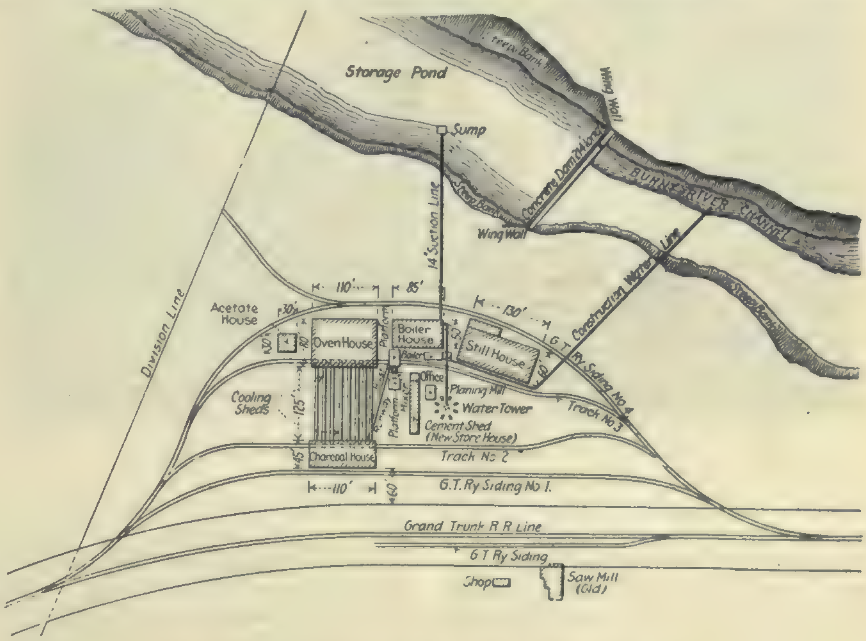


Fig. 2.—General Layout of the Wood Distillation Plant.

Fig. 1.—General View of Works, Showing Dam in the Foreground.

The gases pass out through copper pipes into copper condensers. A liquid is formed consisting of pyroligneous acid and tar, whitish in color with streaks of brown indicating the presence of tar. This liquid is run into tanks and the non-condensible vapor, known as wood gas, is conveyed to the oven fire through long pipes, where it is used as fuel

The liquid consisting of alcohol, tar and acid is pumped to the Still House. In this building the process of refining is carried on. The pyroligneous acid is freed from the tar which is stored in a tank and used as fuel. The pyroligneous acid is now carried through an arrangement of machinery to the "Lime Lee" still, where, in contact with lime. the acid of the liquid is neutralized and a compound, acetate of lime is formed. This forms the basis of smokeless powder and has a wide market.

When the remaining liquid leaves the lime lee, it is still a combination of al cohol, oil, water and a few impurities,

the alcohol being about 15 per cent. strong. It is then run through the 80 per cent. still where its strength is brought up to almost absolute purity The alcohol, when taken from the tanks,

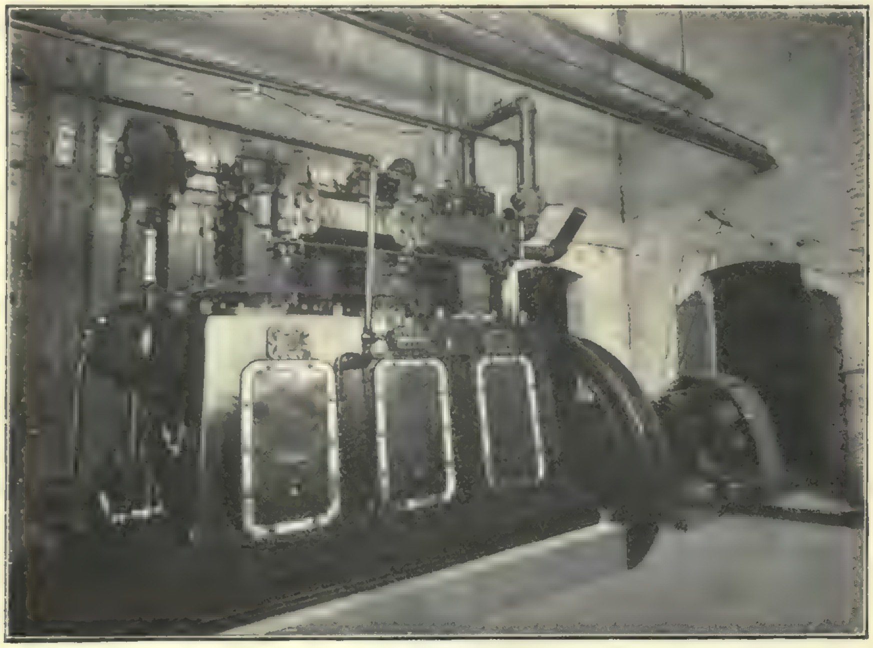


Fig. 4.—Warren Gas Engine Direct Connected to Generator.

is placed in large barrels, lined with glue to preserve the contents. The alcohol purified, is used in the manufacture of fine shellacs and gums. The series of copper tanks and stills are shown in Fig. 7.

Returning to the acetate of lime, it is taken from the tanks to the drying rooms above the ovens and the heat of the ovens is used making a very economical arrangement. There are 10 000 lbs. acetate produced each day and placed in bags for shipment.

After roasting twenty-four hours the cars are drawn by a vertical electric windlass arrangement to a second air tight compartment where it is left another twenty-four hours. This is repeated in a third air-tight enclosure for another twenty-four hour period. The cars of charcoal are then left in the yard for a day when it is screened and loaded automatically in box cars for shipment.

The Power Plant.

One of the economical points in regard to gas producer plants is the quality of fuel which may be used to generate gas. The Warren plant installed in the works of The Wood Products Co. by W. H. Oliver & Co., Toronto, is unique in this respect. The waste charcoal that would otherwise be a loss is turned into power, the generated gas driving a three cylinder 125 h.p. engine, direct connected to a Canadian General Electric generator and belt connected to a John Inglis triple acting pump.

The layout of the engine room is shown in Fig. 3. The equipment consists of the three cylinder 125 H.P. Warren gas engine and C. G. E. generator. John Inglis 1,500 gallon pump, 1,000 gallon Blake pump, 18x10x20 and 70 R.P.M., supplied by R. H. Buchanan, Montreal, motor for running small Rand air compressor. A gasolene engine is also connected to the air compressor countershaft so that air pressure may be secured to start the engine. A one panel C. G. E. switchboard contains the necessary switches, D. C. voltmeter and D. C. ammeter.

A concrete dam 214 ft. long has been

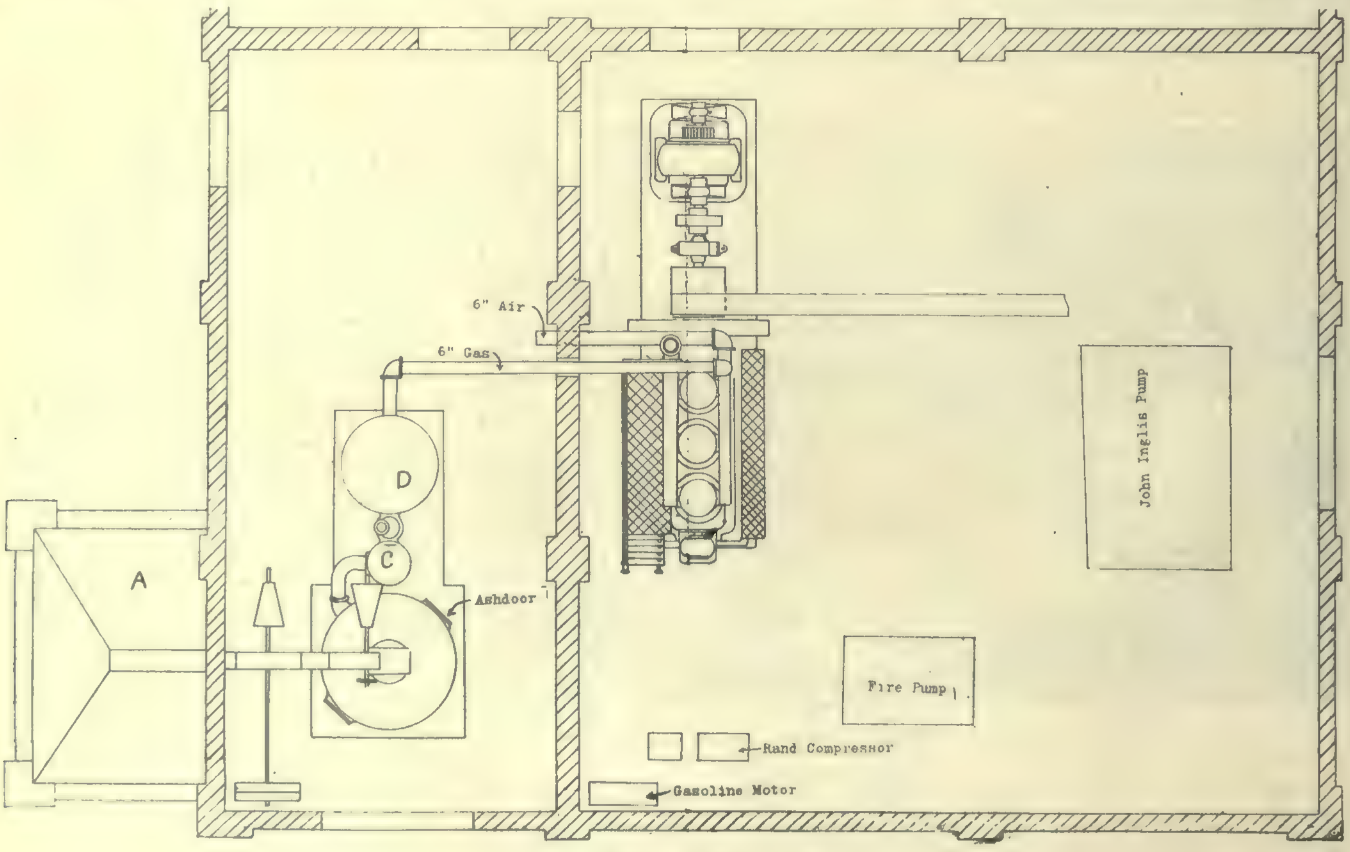


Fig. 3.—Plan of Power House.

built across the Burnt River to ensure a water supply throughout the year. This dam is shown in the foreground of Fig. 1. This view shows also a 50,000 gallon water tower which is 93 ft. high, both stand and tank being constructed of concrete.

A pan shown at B, fig 4 contains water and generates steam. When the gas is produced it is led through C, fig 3, where there is a spray of water. This economizer contains a number of baffle plates and the sprayed water drips from one to the other. The air is

engine to remove any tar not taken out by the excelsior.

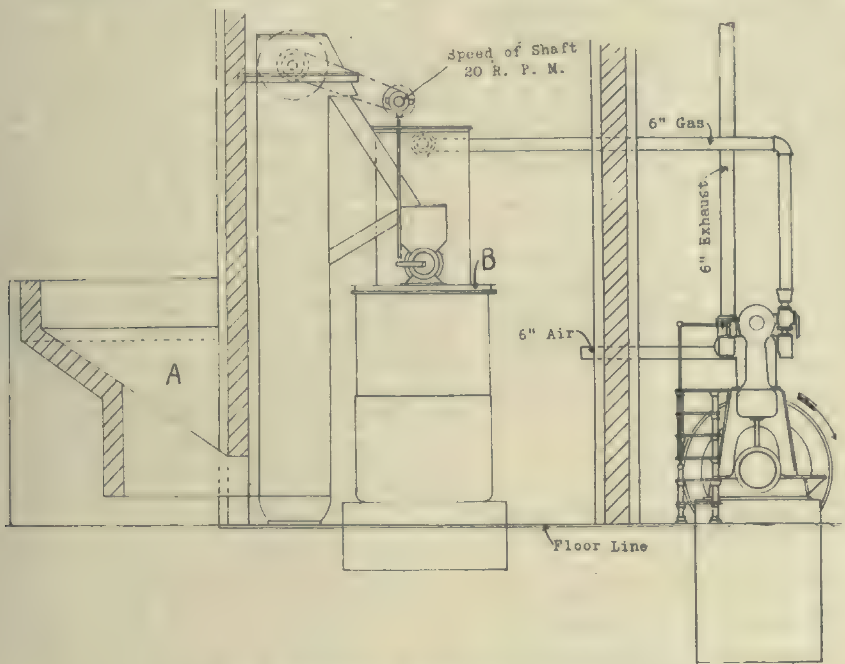


Fig. 5.—Elevation Showing Pipe Connections.

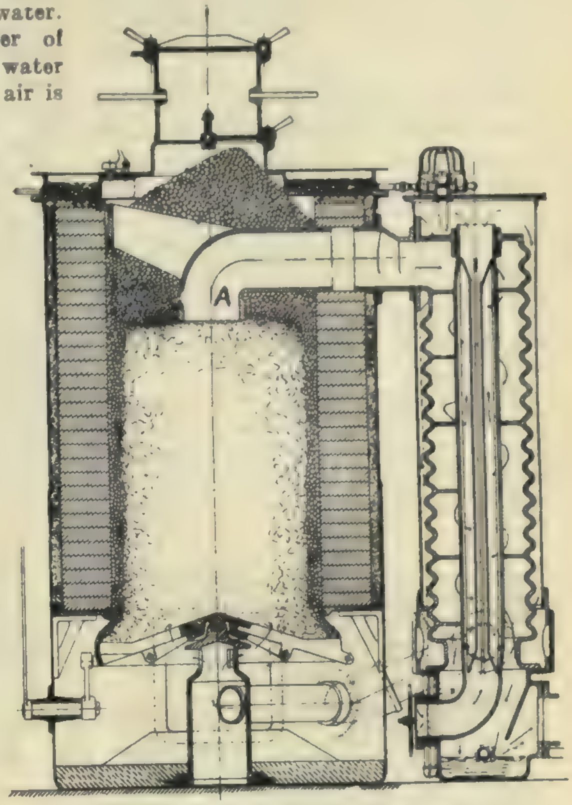


Fig. 6.—Section of Warren Producer.

The Boiler Room.

The boiler house is 52x90 ft., one story high, with a monitor roof. A battery of four 150 H.P. boilers, supplied by John Inglis, supplies the steam required for the plant. The fuel is the soft and refuse hard wood from the neighboring limits, also large quantities of marsh gas and wood tar driven off from the retorts during the destructive distillation process.

The tar is pumped from the still house and blown in under the boilers by a steam jet. All water is condensed, collected and used in the boiler again.

The boilers are located in the north end of the boiler house, large wood storage space is in front of the boilers and large openings are provided in the boiler house walls to pass the wood through. These openings are closed with rolling steel shutters.

The Gas Producer.

At the side of the boiler-room is the power and producer gas room. The charcoal braise, the fuel used in the producer, is stored in a reinforced concrete bin at the side of the producer gas room, showed at A in Fig. 3. The producer is suction type.

The charcoal is fed automatically into the producer. The feed is regulated and if a greater amount than is required it is returned to the storage bin.

regulated by means of a damper in the bottom of C. The steam and air mix in the producer, go up through the fire, down an independent passage in econo-

Fig. 7.—Interior View of Still House.

mizer C, through a purge valve into D which contains coke and water which is sprayed in from the top. The top of D, for about two feet is filled with excelsior which removes the tar from the gas. A tar extractor is placed in the gas pipe between the producer and

The Engine.

Fig. 4 gives a good view of the engine direct-connected to the generator. The engine and plant was made by Struthers Wells Co., Warren, Pa., and installed by their Canadian agents, W. H. Oliver & Co. The engine is a three cylinder one. On account of the continuous process in a wood products plant the engine must run without any stops. A valve may be removed and

replaced in one cylinder while the other two carry on the work.

The cylinder of the engine is designed to prevent any water leaking into the explosion chamber, yet it permits expansion of the inner wall without throwing any stress on the casting.

The cylinder wall of the engine is lubricated by a Warren force feed system. The main bearings and cam shaft bearings are ring oiling. The wrist pin bearing is lubricated through the medium of a tube, fitted with a ball check valve. The tube on the downward stroke of the piston enters the oil receptacle and the oil is forced to the wrist pin bearing. The bearing is of ample size and adjustable.

The crankcase forms the outer wall of the water jacket at the lower portion of the cylinder, thus providing effectual cooling for the cylinder at the lowest portion of the stroke.

The point of ignition can be varied while the engine is operating. The method of governing and the construction of the valve cages, the location of the cam set on the top of the cylinder, where it is readily accessible, are features of up-to-date practice in gas engine design.

The whole plant including instalation of power equipment, and construction was carried on under the supervision of William H. Oliver, C.E., Toronto, with J. M. Wilson, C.E., as assistant. Pitt & Co., Niagara Falls, had the contract for the concrete work.

The officers of the company are: J. A. Kammern, President; R. A. Oliver, after whom the town is named, Secretary-Treasurer, and W H. Oliver, General Manager. James Montgomery is Superintendent.

The Method of Cutting Parallel-Depth Bevel Gears

Gears of Parallel-depth are now being used for Machine Tools with Good results. Method of Laying Them Out and Method of Cutting Them.

A type of bevel gears with parallel depth and many advantages, is being used by the London Machine Tool Co., Hamilton. They are giving good results and in a test were speed up to 700 r.p.m. These gears are laid off from the front on small end of the tooth. With this design there is a small slippage but it is so very small that it can be neglected. This method is a money-saver where bevel gears are to be cut.

The making of bevel gears with parallel depth is not new but is not very widely used, nor is it very well known. Two writers in the American Machinist of recent date have explained very fully the method of laying out and cutting gears with parallel depth teeth and the following description of these methods is taken from their article.

By this plan of producing bevel gears, special cutters are not needed; ordinary stock cutters used for spur gears answer every purpose, and produce far better results. Besides, not needing special cutters, the length of the tooth is not limited, as almost any length of tooth within reasonable limits, can be cut. The teeth of the pair of gears match perfectly without the necessity of filing or rounding off on top, as required by the old method, as the cutter leaves them in proper shape. Also, there is absolutely no guessing about the matter; everything is determined beforehand and the gear is produced without any cut and try, and with the positive certainty that it will be right when finished.

In using this plan the number of teeth are calculated on the inner or smaller pitch circle, or having a required number of teeth, the pitch diameter is calculated for the inner pitch circle, selecting a pitch that will be of suitable strength for the work to be done, always bearing in mind that the teeth of bevel gears produced by this plan will be several times as strong as those made by the usual method because the tooth grows thicker towards the larger diameter. Thus a finer pitch should be selected than would be for a spur gear to transmit the same power in order to make a better proportioned gear.

Laying Out the Gears.

Having determined the pitch and number of teeth for both wheel and pinion, lay out the pitch and circle of the wheel A, Fig. 1. Draw the line B and at right angles thereto lines C and D; on the line C draw the pitch circle E; draw the line F through the centre of E; then through the intersection of F and D, and G, H and I draw pitch—cone lines J and K. Then the angles L and M will be the proper setting for the dividing head, and also, be the angles to turn the gear blanks for the tops of the teeth. The diameter is plus one part of pitch above the pitch line as at O O and P P. Now draw the back-cone lines R and S. Twice the distance of R, in inches, will be the pitch diameter of a spur gear, the number of teeth of which should be used to select the proper cutter for the wheel; twice the distance S in inches, will be the pitch diameter of a spur gear, the number of teeth of which should be used to select the proper cutter for the pinion.

It will also be noted that the top and bottom of the teeth are parallel with the pitch line as in a spur gear. This angle is also the correct setting of the dividing head when cutting the gear, the bottom angle is the same as the angle of the pitch cone. The teeth can be produced by two cuts, and will give good results on pitches up to, say, 6-pitch. It is better in cutting coarser pitches to first cut the teeth through straight on the centre; then set over sidewise, first for one side of the teeth, then for the other side, and finish the teeth with three cuts. The proper amount to set over sidewise is always just one-half the thickness of the cutter at the pitch line, each side of the centre, because the contact or working

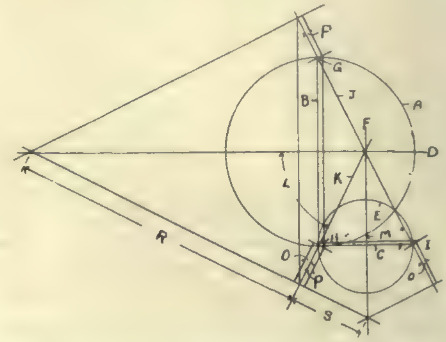


Fig. 1.—Layout of a Set of Parallel-Depth Bevel Gears.

surfaces of the teeth of bevel gears must converge at the point where the axes of the shafts meet—excepting skew bevels—and by setting over sidewise one-half the thickness of the cutter at pitch line, the side of the cutter at the pitch line is brought over the centre line of the gear, and, of course, will cut the side of the tooth so that if it were continued it would meet the point where the axes of the shaft meet; but it is not necessary that the line of the tops and bottoms of the teeth meet at the same point. In other words, the gears are two cones whose contact surfaces are the pitch line, or pitch cones; the teeth are formed partly above this surface and partly below it. It is not necessary in a practical working gear that the tops and bottoms of the teeth converge at the vertex of the cone, but may be made parallel to the pitch line at O O and P P, Fig. 1. But the sides of the teeth must meet at the vertex as at M M, Fig. 2.

Having set over one-half the thickness

of the cutter, rotate the gear until the cutter will just come into the cut at the inner circle without touching either side, ccarry the cutter through, then set over in the opposite direction one-half the thickness of the cutter, as before,

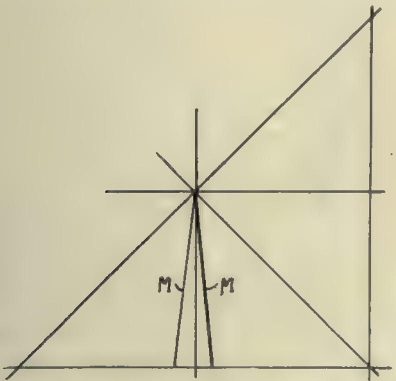


Fig. 2.—Diagram of Sides of Teeth.

turn the gear back until the cutter will come into cut as for the other side and carry the cut through on this side of the tooth, thus finishing one tooth space. Now, without changing the setting, cut the rest of the teeth around the gear, then set back to the setting for the first side of the tooth and go around the gear again, cutting the other side of the teeth; this will complete the gear with two cuts to each tooth, and if the work has been carefully done, the gears will be finished, and require no refiling or doctoring of any kind. They may be put into service at once.

The lathe work on the blanks needs to be good, machine work; being careful that the face angles are correct, as this is the only angle of importance. This face angle will also check the setting of the dividing head on the milling machine, as the cutter should just touch across the face, as in cutting spur gears. Or, assuming that the dividing head is

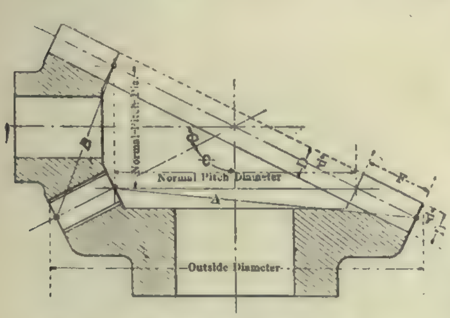


Fig. 3.—Parallel Toothed Bevel Gears.

set to the correct angle, this will check the correctness of the lathe work. This ability to check lathe work against milling work, and milling-machine work against lathe work, insures against making any mistakes in cutting an improperly turned blank. There is no good reason for any mistake or failure to produce by this method any bevel gear wanted, positively and accurately from start to finish; all the work is predetermined with the some certainty as the production of spur gears. S. K. Allen describes a pair of these gears which ran very smoothly. The real difference between these gears and the usual bevel gear consist in two things: 1, the normal pitch diameter is located at the inner end of the teeth instead of at the outer; 2, the centre angle, face angle and the cutting angle are identical. This gives a tooth of standard height at all places (whence the name "parallel tooth gears") and a very strong tooth, for, as the thickness of the teeth on the pitch line is standard at the normal pitch diameter and the height is standard at all places, it follows that the thickness is greater than standard at all places outside of the normal pitch diameter; hence there is a thick strong tooth. Referring to Fig. 3, the normal pitch diameter is the starting point when laying out these gears. It is equal to the pitch diameter of a spur gear of the same number of teeth and pitch; D and d are the same as a spur gear with standard teeth of the same pitch.

Cutting the Gear.

To cut use the same cutter as for spur gear of diameter A, or A x P equals the number of teeth in a spur gear of diameter A. Select a cutter suitable for a spur gear with the number of teeth thus found. The cutter for the pinion must be selected by the same method from dimension B. The angle may be found the same as for any bevel gear; namely,

$$\text{Tang. } O = \frac{\text{teeth in gear}}{\text{teeth in pinion}}$$

The pinion angle O = 90 deg.—O when the shafts are at right angles.

O D =(normal P D) + (2 F sin. O) + (2 D cos. O) for the gear. The pinion outside diameter may be found by the same formula by substituting the pinion angle O.

To cut the gears on any universal milling machine it is necessary to cut three times around the gear, as follows: 1st. cut, place the cutter on centre and cut straight through the gear at the given angle; 2nd cut, move the table toward the spindle one-half the thickness of a standard tooth, then roll the gear away from the spindle one-fourth as many holes as are used altogether to space between teeth and cut through; 3rd cut, move the table away from the spindle the full thickness of a standard tooth, then roll the gear toward the spindle one-half as many holes as are used altogether and cut through. This finishes the gears complete, ready for use.

PERSONAL NOTES.

John M. Wilson, C.E., of the engineering firm of W. H. Oliver & Co., Toronto, was married on April 22 to Miss Luta A. Welch, daughter of Ald. Welch, Toronto. Mr. and Mrs. Wilson are spending their honeymoon in New Orleans and Pas Christian on the Gulf of Mexico. Mr. Wilson is a graduate of the S.P.S., Toronto, and has been associated with W. H. Oliver & Co. for some time.

The Dominion Rifle Association has recently made a very popular selection in appointing Lt.-Col. Bertram to command

LIEUT.-COL. BERTRAM.

the Canadian Bislev team this season. Colonel Bertram has been very active for many years in Canadian military affairs and very well deserves the honor of such an appointment. He is very well and favorably known to the iron and steel trades in Canada owing to his active connection and membership in the John Bertram & Sons Co., Dundas, Ont., machine tool manufacturers.

The board of management for the Canadian Government railways which includes the Intercolonial Railway, and the Prince Edward Island Railway Systems, consists of M. J. Butler, deputy minister and chief engineer of the Department of Railways and Canals, as chairman of the board, D. Pottinger, the present general manager; E. Tiffin, now general traffic manager, and F. P. Brady, of Montreal.

The Electric Furnace in the Iron and Steel Industries

The Results of Experiments Carried on at Niagara Falls, Canada, by the American Furnace Co., Showing the Possibilities of the Electric Furnace.

By T. ROWLANDS*

The induction furnace has opened a field for electric furnace work in the iron and steel industries, which heretofore has been little exploited. This field comprises the melting of metals, such as iron, steel or brass for casting purposes, and the induction furnace offers great advantages in this field. A great advantage of the induction furnaces for work of this character is the absolute control of the quality of the metal from which the castings are made. The construction of the furnace is such that no impurities are introduced into the metal during the melting process, and, therefore, by charging the furnace with metal of a known analysis, it is reasonably sure that castings will be obtained of a predetermined composition. A consideration of the construction of the furnace will make evident the reasons for these statements.

* Manager American Electric Furnace Co., Niagara Falls, Canada.

In Fig. 1 are shown plan and sectional views of a Kjellin induction furnace, as installed at a demonstration plant built by the American Electric Furnace Co., of 45 Wall Street, New York, at Niagara Falls, Ont. This company, which controls the Kjellin, Colby and other induction furnace patents erected a demonstration plant at Niagara Falls, Ont., equipping it with a 10 to 20 kilowatt laboratory type, a 40-60-kilowatt experimental type, and a 100 to 150-kilowatt small commercial type steel furnace. In addition to the furnaces, there are suitable casting arrangements, such as ladles, ingot molds, etc.

The induction furnace is in effect a transformer, in which the bath of metal to be melted forms the secondary. The metal being operated on is in a circular trough or annular crucible as shown. A laminated core on which is wound a coil of wire forming the primary is placed concentric with the circular trough. A laminated yoke connects the two extremities of the core passing over, behind and below the trough, as shown. Alternating current being led into the primary coil, a current is induced in the metal in the trough. This current has the effect of heating the metal, and there

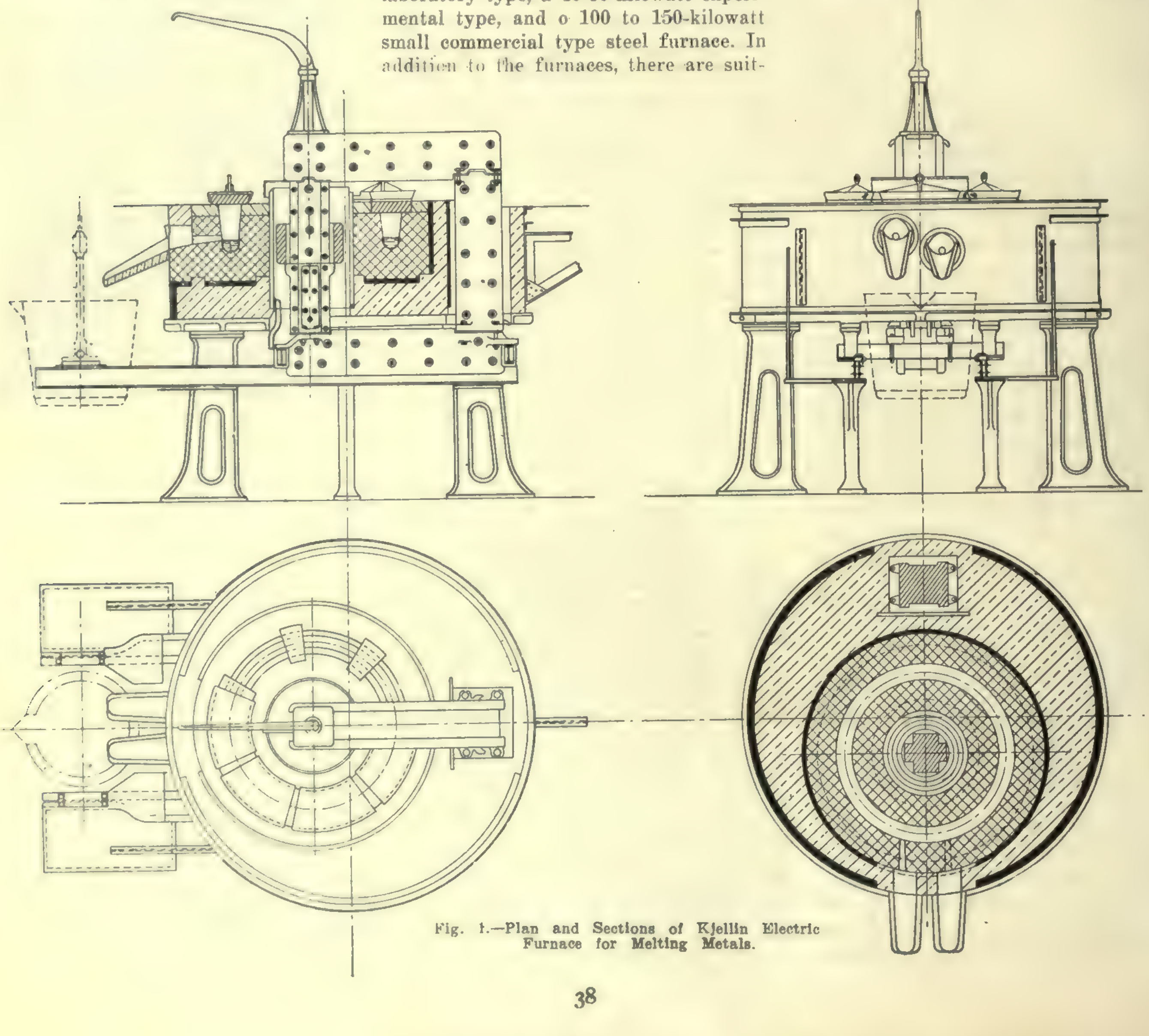


Fig. 1.—Plan and Sections of Kjellin Electric Furnace for Melting Metals.

being no escape for the heat, the metal is rapidly fused and soon attains a liquid condition. The lining of the trough is magnesite or dolomite, although any suitable refractory could be used, if it were desired to undertake a refining action in the furnace. For purposes of melting, however, and for accurate control of the quality of the metal, an absolutely neutral lining is essential. At the Niagara Falls plant, magnesite, which is of course basic, is used.

The Niagara Falls instalation uses, in connection with the 150-kilowatt furnace, a transformer which steps the line voltage obtained from the Canadian Niagara Power Co., down to a normal potential of 525 volts. In series with the transformer are an induction regulator and a 5-point contact connected to taps from the primary coil of the transformer, by which the voltage of the secondary of the transformer may be varied from 475 to 600 volts. The secondary of the transformer is connected to the induction furnace and by varying the voltage in the primary of the latter, a greater or less current can be obtained to meet the varying demands, according to the condition of the bath in the furnace. The current obtained from the power company is on the 3-phase system and a synchronous motor is connected up to one of the legs of the circuit, in order to raise the power factor of the system. With the synchronous motor in operation the power factor has been raised to over 80 when using the induction regulator. With the motor not running the power factor runs along between 60 and 70 per cent. The curve, shown in Fig. 4, is on a run when regulator was cut out.

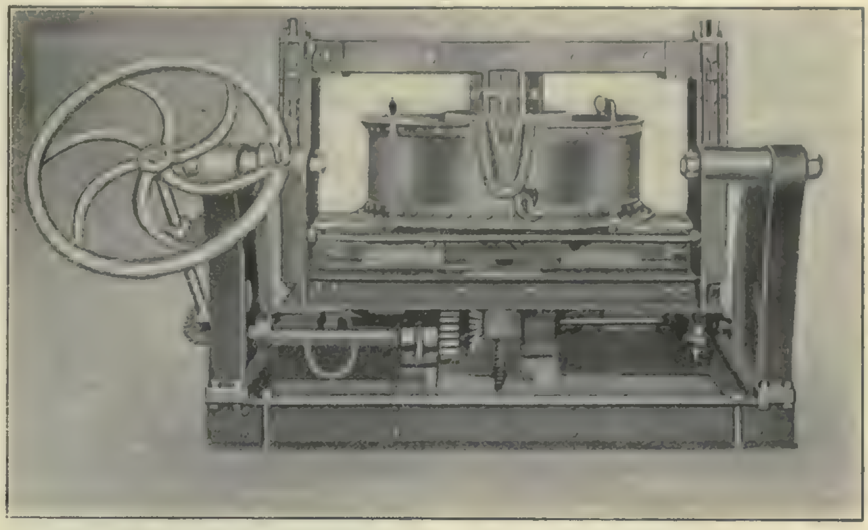


Fig. 3.—Five-Ton Kjellin Electric Furnace at Niagara Falls.

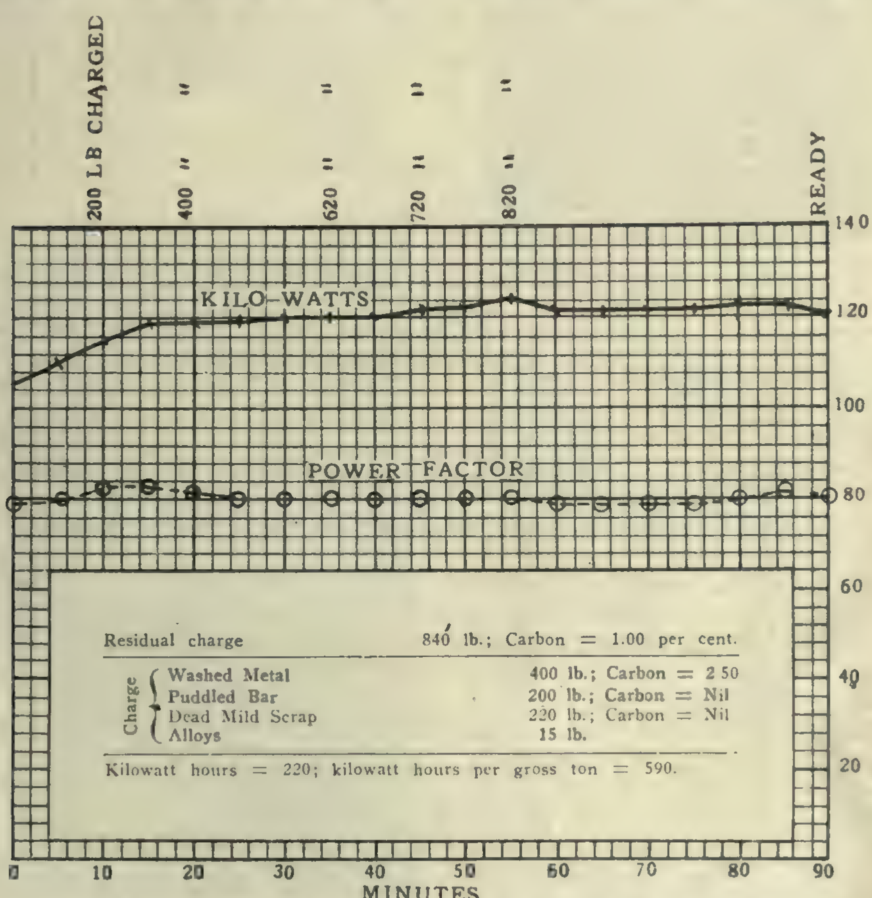


Fig. 2.—Curve of Power Consumption and Power Factor of a run of the Kjellin Furnace at Niagara Falls.

It is evident from the construction of the furnace that, as the trough containing the metal is covered, there can be little oxidation of the metal in the bath. A little lime is introduced with the metal, in order to form a protecting slag, and to keep the metal from contact with such air as may be in the trough. It is also evident that as there are no impurities to be introduced from carbon or other electrodes and that inasmuch as the lining is neutral, the quality of the molten metal must remain practically the same as the original charge. It is this fact which gives the induction furnace its wide openings for the manufacture of castings, and enables it to conform to the most rigid specifications. If a casting is required containing a certain percentage of silicon, and not over a certain percentage of phosphorus and sulphur these specifications can easily be met by charging the furnace with pig iron containing the required, or less than the required, percentage of silicon and phosphorus and sulphur, which are within the limits of the specifications. Inasmuch as no phosphorus or sulphur can be introduced during the process of melting, and as the silicon content can be brought up to the required point by the addition of the proper quantity of ferro-silicon, either in the ladle or the furnace itself, there is no difficulty in making castings of the required analysis. The same remarks apply with equal or greater force to brass melting. At Niagara Falls there has been produced several tons of high silicon steel from the magnesite lining by making ferro-silicon additions to the ladle. The iron was practically carbonless. Great care must, however, be taken to attain these results.

In melting brass by the induction furnace the melting trough may be luted

down, excluding all air and reducing the chance for oxidation of zinc to a minimum, and the temperature is under perfect control, by means of variation in the current in the primary coil.

In steel melting, the Kjellin-Colby furnace is only intended for melting high-grade steels, such as are usually produced in the crucible. It is not intended to compete with the open-hearth or Bessemer process, inasmuch as no refining is attempted, and the quality of the finished steel depends entirely on the material charged. When carrying out demonstrations at Niagara Falls, it has been the practice to use muck bar, washed metal and Swedish white iron. Other metals have been used in connection with special demonstrations, as old rails, boiler plate scrap etc., and in still other cases, alloy steels have been made and cast into ingots and green sand molds. In operating the furnace, the process is of the continuous character. About two-thirds of the bath is drawn off at each cast and the raw material charged into the molten metal remaining in the furnace.

In drying out a new lining, which is made from magnesite two rings of cast iron of high quality are used. These are gradually brought up to their melting point, a suitable pyrometer being used to enable the temperature to be governed accurately. The time consumed ranges from 60 to 70 hours.

As instances of the performance of the furnace, where the residual bath was about 850 pounds, 910 pounds were charged and melted in 68 minutes and poured in 1 hour and 30 minutes. The power consumption was equivalent to 440 kilowatt-hours per gross ton. In another case, in which low carbon steel was melted, the charge was 1,000 pounds and the power consumption was 560 kilowatt-hours per gross ton.

Another advantage offered by the electric furnace in melting metal for casting purposes is the fact that it is unnecessary to entirely drain the furnace at the end of the day's run. If the last cast does not require all the metal which has been charged to the furnace it is entirely feasible to allow it to remain in the crucible until the next day merely leaving enough current in the furnace to prevent the metal from freezing.

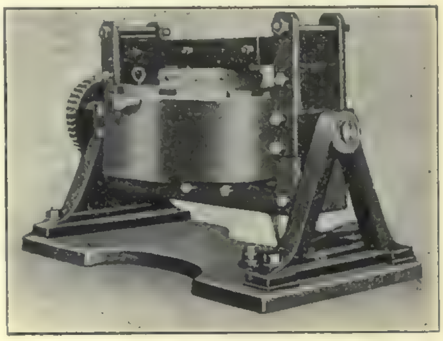


Fig. 4.—Laboratory Type Kjellin Furnace for Universities.

As to the cost of melting in the electric furnace, it naturally depends upon the price at which electric current can be obtained. At Niagara Falls one man can look after the small furnace installed without any assistance. The number of men about the plant depends on the equipment, but for furnaces where ingots only are cast, and adequate arrangements are made for handling the metal, two men and one boy per turn should be amply sufficient for all requirements. The lining of the furnace lasts from four to eight weeks, according to the size of the furnace and the quality of the material melted.

The following table illustrates the enormous saving in the reduction of steel:

Basing the power consumption at about 750 kilowatt-hours per ton, the cost of melting would be at a charge for current of one-half cent per kilowatt-hour:

750 kilowatt-hours at 0.5........	$3.75
Lining, per ton	1.00
Total	$4.75

According to high authority, the life of a crucible is about seven rounds, sometimes more, but generally less, and coal used per ton of steel, about 2,650

2,650 pounds	$ 3.00
Crucible upkeep	8.00
Total	$11.00

The wastage with this process does not amount to over 2 per cent. The illustration Fig. 2, is a typical curve of power consumption and power factor of a test run in a furnace at Niagara Falls. The various steps in the process are clearly shown, together with the total energy consumption and the time of each operation. The lower curve shows the power factor, which, it will be noted, dropped as the charge was reduced to a liquid. As the factors entering into the current consumption are all given in the curves the cost of operating a furnace of this type can be estimated wherever the cost of energy is known.

In another test the furnace started with a residual bath of about 850 pounds and the voltage on the primary was 580 volts. The requisite metal was then charged, comprising 450 pounds of muck bar and 450 pounds of washed metal. The voltage on the primary was lowered to 475 volts after the charge was completely melted, which required about 68 minutes. The slag was then removed, extra care being taken, as an alloy had to be added to the ladle to produce a special steel, the time consumed being 10 minutes, after which the voltage was again raised and ferro-manganese and ferro-silicon added. From the time of starting to add the alloys until the first cast, 450 pounds, was made, 12 minutes elapsed. There was an interval of 3 minutes between the first and second casts, to permit of adjustment of the electrical apparatus, when no current was on, and then current was on for 7 minutes while preparing the ladle for the second cast.

OBSERVATIONS MADE AT THE PLANT OF THE AMERICAN ELECTRIC FURNACE COMPANY, NIAGARA FALLS, CANADA, DEC. 2, 1908.

Time. A.M.	Volts.	Amperes.	KVA	Kilowatts.	PF	Remarks.
11 : 25	[illegible]	225	133	105	0.79	Start of charge 840 lbs. in bath
11 : 30	590	230	136	110	0.80	
11 : 35	584	240	140	115	0.82	200 lb. wash metal charged
11 : 40	574	250	143	118	0.82	
11 : 45	574	252	145	118	0.81	200 lb. muck bar charged
11 : 50	569	257	146	118	0.80	
11 : 55	574	260	149	120	0.80	
12 M	569	262	149	120	0.80	220 lb. ingot charged.
12 : 05	569	264	150	120	0.80	
12 : 10	567	268	152	122	0.80	100 lb. washed metal charged
12 : 15	569	270	154	123	0.80	
12 : 20	569	274	156	124	0.80	100 lb washed metal charged
12 : 30	559	280	157	122	0.79	
12 : 35	564	260	158	122	0.79	
12 : 40	564	260	158	122	0.79	
12 : 45	559	282	158	122	0.79	
12 : 50	564	272	153	123	0.80	
12 : 55	559	272	152	123	0.81	
1 : 00	554	272	150	120	0.80	Metal all fluid.

Metal in bath at start of charge about 1 per cent. carbon.
Wash metal, about 2.5 per cent. carbon.
Ingots about mill carbon.
Muck bar, about mill carbon.
Watt meter : 8,170—7,950 equals 220 K. H. hrs.

NATIONAL MACHINE TOOL BUILDERS' ASSOCIATION.

The regular spring meeting of this association will be held at Milwaukee, Wis., on May 25 and 26. The headquarters will be at the Plankington, Wis.

Monel Metal: A Natural Alloy of Nickel and Copper

A Brief Description of the Properties of this Metal—Interesting as to its Possibilities in the Future of Engineering—Results of Tests.

By W. E. D. WILKES, B.Sc.

At a meeting of the Mining Section of the Canadian Society of Civil Engineers, held in the society's lecture room, Montreal, on Thursday evening April 1, the first authorized announcement, to any body of engineers, was made concerning the development of a new alloy, known as monel metal.

In introducing the subject Dr. J. B. Porter spoke briefly on the general properties of the metal, calling attention to the possibilities of its use. He was followed by Dr. A. Stansfield, who read a paper on the metallurgy of the metal, explaining the process of reduction from the ores and the results of chemical analysis made on samples obtained from the producers. The second paper, dealing with the physical properties and results of tests, was read by Prof. E Brown, of the Canadian Copper Company, who exhibited test samples showing the condition of cast, rolled, annealed and unannealed pieces at the point of fracture, etc.

This metal was first "discovered" nearly four years ago by the Canadian Copper Company's metallurgists while endeavoring to avoid the necessity of separating the nickel from the copper as found in the ores of their Sudbury mines. They found that the alloy obtained by reducing these metals together, merely removing the iron, sulphur and gangue matter from the ore, possessed many valuable properties, having the strength of steel with greater ductility, and the freedom from corrosion of nickel itself.

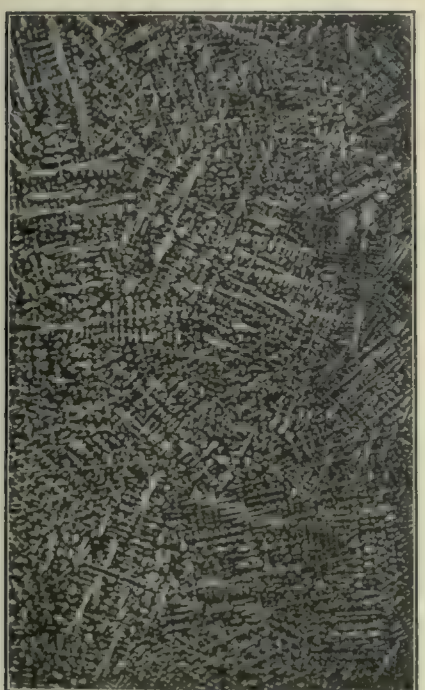


Fig. 1.—Cast Metal 15 Diams.

Fig. 2.—Light and Dark Parts Show Size of Crystalline Grains.

Monel metal, which was named after Mr. Ambrose Monell, president of the International Nickel Co., is a combination of nickel and copper in proportions, very approximately as they occur in the ores. These proportions are 68 to 72 per cent. nickel to 25 to 29 per cent. copper. The alloy also contains a little iron, about 2 per cent., and slight traces of sulphur and carbon. The melting point of the metal is approximately 1350 deg. C.; the specific gravity of the cast metal is from 8.86 to 8.87, while that of the rolled is 8.94 to 8.95. It is easily rolled at temperatures of from 900 degrees to 1,200 degrees C. and can be finished hard or soft similar to sheet copper.

In appearance the metal is a silver-white and is easily polished to a high finish and this finish will remain almost indefinitely. Its non-corrodibility, has been demonstrated by a 56-day test with 40 degrees sulphuric acid, which produced no loss whatever. This test was made with specimens of rolled metal which had been coated with oxide by merely heating.

Easily Drawn or Cast.

The metal may be as easily drawn and cast as it is rolled and among the possible uses of the hot-rolled, appear such as roofing, ventilators, smoke stacks ship plates, etc., the cold rolled sheets being used in making hospital equipment, watch cases knives, forks, spoons, etc.

For castings which are subject to severe strain or shock, it is admirably suited, as has been demonstrated by its use in making propeller wheels, cast solid hub and arms. One of these, weighing about three and a half tons, was found to be slightly warped when cool, due to the fact that enough information had not, at that time, been gained re-

Fig. 3.—75 Diams. Rolled, Etched Light. National Disk Sharpener.

garding the shrinkage of the castings. The extreme ductility of the casting was shown by squeezing the blades to the proper angle and pitch without in any way injuring the metal. The metal's non-corrodibility makes it suitable to marine work and there is no doubt a large future ahead of it in this branch of engineering.

When drawn into wire or rolled into bars it is adaptable to valve-stems, shafts, piston rods, resistance wire, rustless screens screws, rivets, etc. When made into bolts it is better than steel for the reason that on a bolt of Monel metal the threads are very much less liable to strip. Monel bolts, half-inch diameter, are 30 to 35 per cent. stronger than steel bolts of the same size.

The accompanying table shows the comparative results of tests on Monel metal, steel and copper.

Figures in pounds per square inch.	Monel Castings. Grade C	Monel Castings. Grade D	Carbon Steel Castings.			Monel Metal Rolled	Monel Metal Rolled Annealed and Cold Drawn	Carbon Steel Forgings.		Nickel Steel Forgings		Monel Rolled Plate	Soft Steel Plate	Copper Plate
			Hard	Medium	Soft			Annealed	Oil Tempered	Annealed	Oil Tempered			
Tensile strength........	70,000	85,000	85,000	70,000	60,000	100,000	110,000	80,000	90,000	80,000	95,000	90,000	60,000	34,000
Elastic limit............	27,000	40,000	38,250	31,000	27,000	50,000	80,000	40,000	55,000	50,000	65,000	45,000	30,000	18,000
Elongation in 2 inches..	30%	25%	15%	18%	22%	30%	25%	22%	20%	25%	21%	30%	35%	52%
Reduction of area......	35%	25%	20%	25%	30%	50%	50%	35%	45%	45%	50%	60%	35%	57

These results show Monel metal to possess a greater tensile strength (about 25 per cent.) than high-grade rolled steel, with a greater elastic limit (about 50 per cent.) and ductility. Besides these qualities, must be remembered the quality of withstanding corrosion, a very important property. Tests on wires drawn down from the rolled metal show them to be soft and pliable as well as very strong. In a compression test on a piece of the rolled metal one-half inch diameter and 1.895 inches long, the surface began to scale slightly at 77,500 pounds and buckled at 95,000. The test piece exhibited showed clearly the ductility, the piece being compressed to one-half its original length without giving signs of any cracks.

The accompanying illustrations are exact size reproductions of micro-photographs of the cross section of pieces of cast and rolled Monel metal. Fig. 1 and 2 are of the same cross-section, but in Fig. 1 the light is directly on the section while in Fig. 2 the illumination is at an angle. The light and dark patches show the size of the crystalline grains. Figs. 1 and 2 are magnified 15 diameters. Fig. 3 is a micro-photograph of the cross section of a rolled specimen magnified 75 diameters and etched lightly.

In working the metal in a lathe or similar machine it gives as satisfactory results as does mild steel without chattering. As the metal draws perfectly into a smooth tube it is very well adapted to use in condensers and flash boilers such as are used on automobiles and in motor boats. Experiments and tests are now underway to determine the physical constants of the metal, its electrical qualities and the effect produced by varying amounts of iron, silicon, carbon copper, etc.

MACLEAN CO.'S NEW MONTREAL OFFICES.

The Montreal offices of The MacLean Publishing Company, which for several years have been located at 232 McGill Street have during the past month been removed to the handsome office structure erected by the Eastern Townships Bank. The new building is one of the finest in Montreal, standing ten storeys high. It occupies a commanding position at the corner of Victoria Square and St. James Street.

The new offices of The MacLean Publishing Company have been specially fitted up for their convenience with every degree of comfort and facility for the transaction of business. The ceilings are high while there is an abundance of floor space for the members of the large staff, the business and editorial rooms being separate yet within easy reach of each other. There is a special elevator accommodation, three high speed traction elevators being installed. This is the only installation of its kind in Montreal, a feature of which is the rapidity and ease with which they can be operated. The cars can be reversed at top speed without any noticeable discomfort to the passengers.

Each floor of the magnificent new building has its own vaults. There are mail chutes, electric light, telephones, electric bells and other modern features on every floor, which make the new premises of The MacLean Publishing Company, which are within a few yards of the late offices, ideal and central from every standpoint.

SEMI-ANNUAL MEETING OF A.S.M.E.

The American Society of Mechanical Engineers will hold its spring meeting at the Willard Hotel, Washington, D.C., May 4-7. Sessions will be held at which papers on the conveying of materials, gas power engineering, steam turbines, the specific volume of saturated steam, oil well pumping and various other subjects will be read and discussed.

During the convention President Taft will hold a reception for the members at the White House. The War Department will give a special exhibition drill of the U.S. troops at Fort Myer, to which the members and guests will be invited. Excursions will also be made to the museums, city pumping station, city electric plant, etc.

The papers to be presented are as follows: A Unique Belt Conveyor, Ellis C. Soper; Automatic Feeders for Handling Material in Bulk, C. Kemble Baldwin; A New Transmission Dynamometer, Prof. Wm. H. Kenerson; Polishing Metals for Examination with the Microscope, A. Kingsbury; Home making in the arid regions; Marine Producer Gas Power, C. L. Straub; An Operating System for a Small Producer Gas Power Plant, C. W. Obert; A Method of Improving the Efficiency of Gas Engines, T. E. Butterfield; Offsetting Cylinders in Single-Acting Engines, Prof. T. M. Phetteplace; Small Steam Turbines, Geo. A. Orrok; Oil Well Tests, Edmund M. Ivens; Safety Valve Discussion; Specific Volume of Saturated Steam, Prof. C. H. Peabody; Some Properties of Steam, Prof. R. C. H. Heck, and A New Departure in Flexible Staybolts, H. V. Willie.

If the conditions are favorable there will be an ascension of a dirigible balloon and an aeroplane during the convention. In that event the Secretary of War, Mr. J. M. Dickinson, proposes to invite the members and guests.

J. A. Kilpatrick, St. Thomas, who is now manager of the Canada Iron Corporation has, with others, acquired the large car wheel works of the Geo. H Thatcher & Co., Albany, N. Y., and is president of the new company.

The Interesting Manufacture of Seamless Steel Tubing*

Description of Processes for Drawing of Seamless Tubes from Solid Steel Billets and from Plates, Illustrating Shelby Steel Tube Manufacture.

Of all the important special branches of the steel industry, the manufacture of seamless steel tubes is perhaps the youngest; and of all young industries, it is probably the one with the most promising future. While the Bessemer process of making steel is about half a century old, the present modes of making seamless steel tubes in the United States date back less than half a generation.

Looking into the early days of the tube industry, the most simple and obvious methods of manufacture were naturally followed first, and "lap-welded" tube was the result—a flat strip of metal of suitable thickness being bent into tube shape until its longitudinal edges lapped, these being afterward soldered or welded together. Welding was first done under a trip-hammer, or sometimes by hand.

In 1825 machinery was invented for butt-welding by means of a chain-bench placed in front of a furnace, the heated tube being carried through a die or bell by means of an advancing chain and tongs, driven by suitable power. This process, with steady modifications and improvements, is esentially the one in use to-day for all butt-welded steel pipe.

Seamless Processes.

The possibility of producing a homogeneous and ductile steel in large quantities is a comparatively recent achievement, and to it is due the remarkable development and success of the seamless steel tube industry in America and abroad. The early efforts of experimenters who aimed at seamless tubes in steel show the influences of the old methods followed for the ductile metals, brass and copper.

In breaking away from the old methods of making brass and copper tubes, the expected steps of departure are seen. What seems to be the first attempt to make seamless tubes appears in 1837, under the English patent of Hanson. This provides a thick, short cylinder of cast-steel, which is raised to a very high temperature and placed into a matrix, and then by means of a hydraulic ram the metal is squeezed through a small orifice around a punch, a seamless tube being the result.

Sometimes solid bars of steel were drilled from end to end to make a tube-

Fig. 3.—Rolling Tubes, hot, After Piercing Operation.

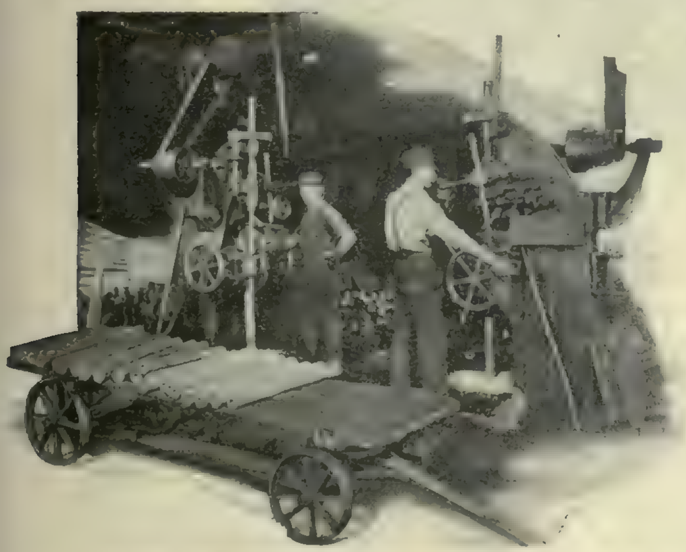


Fig. 1.—Centering Billets before Heating for Piercing Mill.

Fig. 2.—Heated Billet Entering Piercing Mill.

* For the illustrations in this article we are indebted to John Millen & Son, Montreal, Canadian agents for Shelby Steel Tubing.

shape suitable for the cold-drawing operation, but this process was slow and expensive. One of the first attempted processes, while not successful for small tubes, has since been satisfactorily developed for tubes larger than 5 inches outside diameter; this is the cupping method, which consists in pressing a cup or cap from a flat plate and progressively elongating it into a tube by decreasing the diameter while it passes through a series of reducing dies. This method is practiced in the manufacture of tubes from 5 to 30 inches in diameter.

Fig. 5.—Tube After being Mushed Together from Ends.

While the "piercing" process was being perfected, steel-makers were engaged in producing a uniform quality of mild steel which would permit satisfactory piercing and cold-drawing and yield also a finished tube with all the required physical attributes. Both quests—for a machine to work and a steel to be worked—were practically satisfied at the same time, and seamless steel tubes then began to count as a respectable branch of the great steel industry in America. The application of Shelby seamless tubes to marine and naval boilers gave a substantial impetus to the business and directed it along new lines; and when the leading railroads began to specify Shelby tubes for their locomotives, their success and future were finally assured. It cannot be said that either the steel or the methods of making tubes from it are perfect to-day; but it is certain that the initial difficulties have been successfully overcome.

Manufacture of Seamless Steel Tubing From Billets.

Much of the success of Shelby seamless tubing is due to the excellent qualities of the steel used. This steel is shipped to the rolling mills in blooms 7 inches square in section, and about 6 feet long, weighing approximately 750 pounds each. The blooms are sent to the heating furnace, and after acquiring a suitable temperature are rolled from their square section to round bars, which vary in diameter according to the size of tubes required to be made from them. Some of the bars are 6 inches in diameter when finished; others are as small as 2½ inches. For convenience in shipping they are cut to lengths of about 10 feet, and sent to the various tube mills on factory requisitions.

The piercing machines at each mill have different capacities, in sizes and quantities; the "rounds" must therefore be cut again into pieces which will furnish with the least waste the size, length, and thickness of tube required by the factory's orders. After being cut to the working length the steel is known as a billet. It may be from 1 to 5 feet long; but it must contain as many cubic inches of steel as the finished tube, plus enough to cover the losses incidental to manufacture.

It is important that the piercing point should strike the very centre of the solid billet as it advances, for if it does not the steel will be thicker on one side of the finished tube than on the other, and no amount of careful cold-drawing can correct the eccentricity. To insure the passage of the point through the centre of the billet, each one is drilled suitably before it passes to the heating furnace. The bottom of the furnace is inclined, and the centred billets of the proper length are fed into the upper and cooler end, from which they roll by gravity to the lower end, where the temperature is high enough to render the steel soft and semi-plastic. Close to the discharging end of the furnace the piercing mill is located, and the billets are fed into it, centred end foremost, either automatically or, in the smaller mills, by hand.

The solid billet, almost white hot, is pushed forward until it is caught by the revolving piercing disks, and from that point onward the machine completes the operation without the touch of a human finger. When the billet reaches the stationary piercing point of malleable iron, and starts to pass over it, forced by the forwarding and revolving action of the heavy rotating disks, only a slight, dull, grinding sound is audible; there is nothing spectacular about the operation, nor much suggestion of the enormous power required to displace the metal from the centre of the hot billet towards the outside. So powerful are the piercing disks and so carefully planned is each part of the massive machinery that the billet is easily molded into a tube.

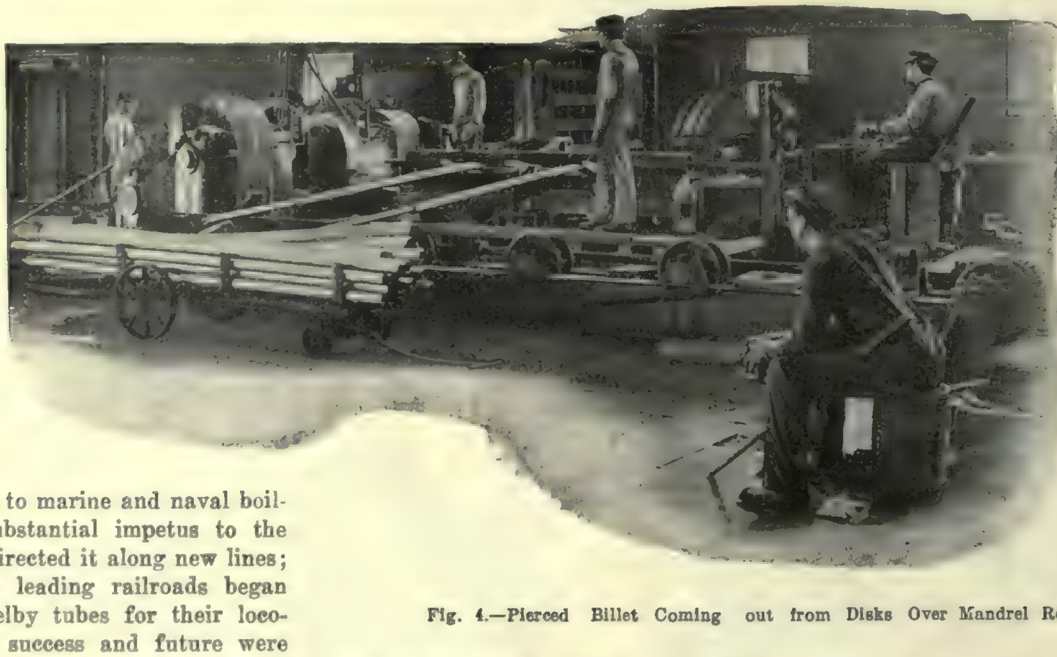


Fig. 4.—Pierced Billet Coming out from Disks Over Mandrel Rod.

The tube is passed a second time to a

heating furnace, and at the proper temperature it is rolled over long round bars of tool steel, through grooves successively smaller, and in this manner converted into a long, thin-walled tube with a fairly smooth surface finish.

Even now it is only a hot-rolled tube, and lacks accuracy in diameter, gauge, and roundity. One more operation known as "pointing" is needed to make it ready for the bench-room. Pointing consists in hammering the heated end of each tube into a solid point, which can be caught by the heavy tongs of the drawbench in which the tube is to be cold-drawn.

Before tubes can be cold-drawn they must be clean and free from scale. They are therefore pickled in an acid bath which is heated and kept in constant agitation by jets of steam.

Cold-Drawing.

The operation of cold-drawing is extremely simple in principle, and not in any manner new. It is practically the same for steel tubes as it is for brass and copper. All that is necessary is strong machinery and enough power to move it. The benches are substantially built of steel, and each is furnished with a heavy, square-linked chain, which runs over a wheel placed just underneath the die. This chain extends along the bed of the bench, for from 15 to 40 feet, to a sprocket which is geared to the main shaft from the engine, and it returns underneath the draw-bench. Dies are made from the very best grade of crucible steel, and are machined to the thousandth of an inch, to govern the outside diameter of the tube which is to be drawn. All tubes except those smaller than ½-in.. inside are drawn over a mandrel. This mandrel is kept in position by a long bar which goes inside of the tube and holds the mandrel just even with the die while the tube is being pulled.

The drawing operation hardens the metal and makes it necessary to anneal every tube before it can be drawn again. It may require from two to twenty passes through dies of varying diameter to produce a tube with the required dimensions. Such a tube must be annealed after each pass to eliminate all the brittleness of the steel which resulted from previous cold-drawn passes and to permit further drawing.

The process of annealing is attended with the formation of scale; and, this necessitates a return of each tube to the pickle-bath each time it is annealed. The intermediate anneals, or anneals between bench-passes, are made in open furnaces; but for the consumer tubes are annealed to the buyer's specifications.

The "points" of the tubes remain until after the last pass through the dies, which brings the tube to the desired outside diameter and thickness; then, after the requisite anneal has been given, the tube passes to the cutting-off machines, where it is either cut to specified lengths or multiples, or cut to the best advantage in random lengths. Boiler tubes are tested by hydrostatic pressure, but mechanical tubes are not so treated.

From the cutting department, the last step in the process is to the shipping-room or to the stock-racks, of which partial views are shown.

Fig. 6.—Group of Cups Used to Make Seamless Tubes of Large Dimensions.

Seamless Tubes From Plates.

The processes so far described are those followed in the manufacture of seamless tubes and tubing from solid steel billets. These processes are employed for all sizes up to and including tubes 5½ inches outside diameter; but for tubes larger than this the methods are different. It will be readily comprehended that to obtain a seamless tube, say 20 inches in diameter, from a solid cylinder of steel would necessitate piercing machinery of most gigantic and unwieldy proportions, and to drive such machinery would require tremendous power.

In small tubes, the ratio of length to diameter is large. Taking a tube measuring one-half inch outside, it is possible to produce it in lengths as great as 40 feet, and the ratio of length to diameter in this case is 960. There are many uses for tubes of this size and length. But a tube 20 inches in diameter is rarely called for in lengths greater than from 6 to 10 feet, and in this case the ratio of length to diameter is not more than 6. Therefore very large, heavy-walled tubes are made from plates of steel, rolled in squares.

The corners are first sheared off to produce a circular disk, which is heated to redness, withdrawn and placed on the anvil of an immense hydraulic press, by which the plate is punched into a rough, shallow cup. The cup is again heated and punched through a smaller die to elongate or deepen it and at the same time to reduce its diameter. Perhaps it goes a third or a fourth time through a similar operation before it is ready for the finishing passes on the hot-draw bench. This apparatus, as shown by the engraving, consists of a heavy cast-steel frame or body, provided with a powerful hydraulic cylinder and a plunger which operates through the full length of the bench. Plungers of various sizes are used according to the size required in the finished tube, and dies of successively decreasing diameter are dropped in recesses in the bench-frame in positions so that the heated elongated steel cup may be forced through them one after another, the final and smallest one pressing the steel down tight towards the plunger for the full length of the tube. The plate has now passed almost completely into tubular form, and the original head, or the bottom of the "cup," forms but a small proportion of it. Subsequent hot-drawing operations may be necessary to produce a tube with a smaller diameter, a thinner wall, or a greater length. Finally the head, or closed end of the tube, which remains until the last operation is completed, is cut off, and the process is finished.

Fig. 7.—Hot Driving Bench Tube in Process.

HOW TO GET THE ACCURATE COST.

By a Cost Clerk.

The cost of a manufactured article consists of three parts or items: burden expense, raw material, and time or labor. This burden expense is arrived at by adding up all of the items of fixed charges, office expense, selling expense, material consumed in manufacturing, such as oil, waste, etc., which cannot be charged direct to any specific article non-productive labor (which should be obtained by dividing the pay roll into two parts of productive and non-productive.) The total of this non-productive pay roll should go into the burden.

Not until work is begun on the raw material is there anything produced by or from which you can get back the money paid out for burden expense, therefore we must add the burden expense to productive labor. How can we add it and have it properly distributed? You will say perhaps a certain per cent. to the cost of material and labor. We have shown you above that raw material had nothing to do with expense, therefore you should not add a certain per cent. to the cost of that material as a burden. It was the productive labor that consumed that burden. Then you say you will add a larger per cent. to the cost of labor. But this will not do. For example, you have two men working side by side at the bench; one you pay 45c per hour, the other man 20c per hour. Each man works on his respective piece of work eighteen hours. By the percentage method you charge, say, 40 per cent. of labor cost on each man's work to cover burden expense. On this basis, for the first man's share you charge $3.24 and only $1.44 for the second man, and you cannot show where the first man consumed more of the actual burden expense than the other, and yet you are charging over twice as much to the first man's labor.

To get the proper amount to add to this labor to cover this expense, you should divide the total amount of the burden expense for the month by the total number of productive hours. Say your burden expense is $720, and your productive hours are 3,600. This gives you a rate of 20c a productive hour, therefore to the first man's wages of $8.10 you add the burden rate of 20c per productive hour, eighteen hours $3.60, making labor $8.10, burden cost $3.60, material $4.50, total $16.20, the absolutely accurate cost. To the second man's wages of $3.60 you add the burden hour rate of 20c per productive hour, eighteen hours $3.60, making labor $3.60, burden cost $3.60, material $1.50, accurate cost $8.70, and to this you add what per cent. of profit you intend to make.

By the percentage basis, add 40 per cent. or $3.24, to the first man's wages of $8.10, material $4.50, making cost $15.84, a difference of 36c short of actual cost. To the second man's wages of $3.60, add 40 per cent., or $1.44, plus cost of material $1.50 making a total of $6.54, a difference of $2.24 short of actual cost. This is where you fall short of making the profit you had figured on. If you will give this careful thought you will see it is the only way to arrive at the accurate cost.

It is comparatively easy to obtain the cost of material that enters into your product, but the time or labor is the slippery element of cost, also the proper burden rate has been difficult to ascertain. By the use of special cost keepers on the market you can get the elapsed time of every operation, every job, exact labor cost to a cent on every order that goes through your works, also the productive hours, which will give you the proper burden rate and absolutely accurate distribution of your burden expense, saving you thousands of dollars a year.

MACHINE SHOP METHODS AND DEVICES

Unique Ways of Doing Things in the Machine Shop. Readers' Opinions Concerning Shop Practice. Data for Machinists. Contributions paid for.

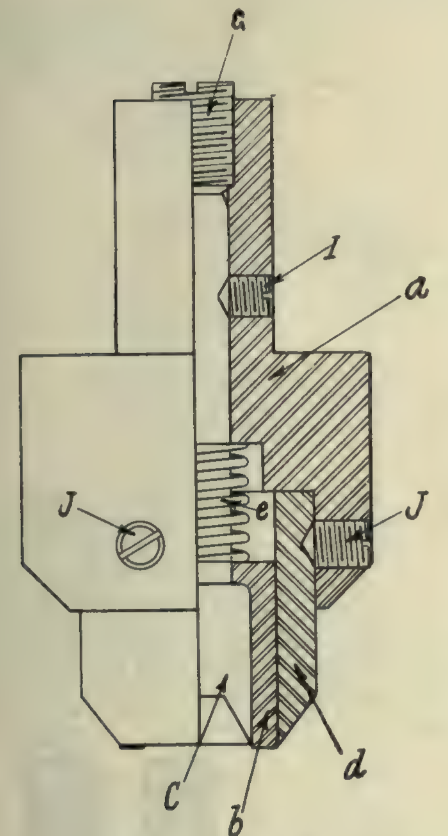
TOOL FOR CUTTING FIBRE WASHERS.

By J. MacFarlane.

The enclosed sketch shows a handy tool for blanking out fibre washers.

A is the punch holder (with stem turned to fit press) bored to receive the centre cutting punch c, and counterbored to receive the outside cutting punch d.

B is the blank holder or pushout kept in position by coil spring e. The screw G takes the end thrust of the centre punch c, which is secured in position by the screw I.



Tool for Cutting Fibre Washers.

The screws J J are to keep the outside cutting punch in position. The stock to be cut is passed between this tool and a plain block of brass, the tool just making an impression on the surface of the brass block.

FINISHING LOCOMOTIVE PISTON CENTRES.

The machine illustrated here is a Gisholt 34-in. lathe, and the operation that of finishing locomotive piston centres. The piece A is first held in the hard chuck jaws B and in addition three chuck, or face plate, blocks C are used between the jaws to give an increased

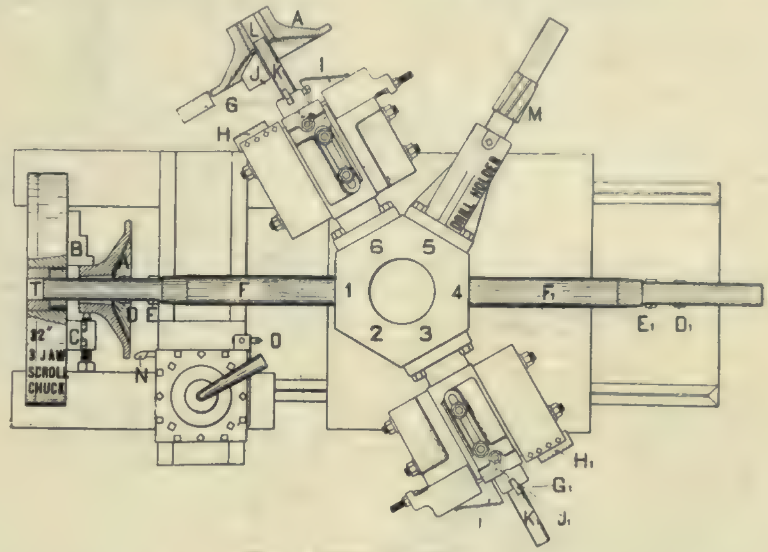


Fig. 1.—First Operation.

grip on the piece. First, the scale is removed from the concave surface and face of piece with tool post toól N, and the hole rough-bored at the same time by cutters D and E in boring bar F, th s bar being supported in the cnuck by bushing T. Cutters E_1 and D_1 in bar F_1 are used for bringing the hole approximately to size and it is finished with the taper reamer M. The hole completed and the scale removed, the bushing L is inserted in the hole in piece and used for supporting the arbors K and K_1, in the facing heads as shown on faces 6 and 3 of the main turret. The four cutters G, H, I and J in the

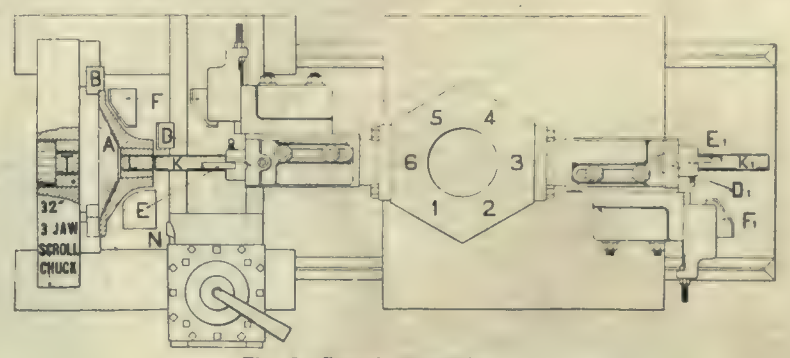


Fig. 2.—Second Operation.

facing head on turret face 6, bring the surfaces indicated to the approximate size, after which they are finished by the cutters in the facing head on face 3 of the main turret. The tool post tool O is then swung into position and used for slightly rounding the corners of the rim, completing this operation.

Second Operation.

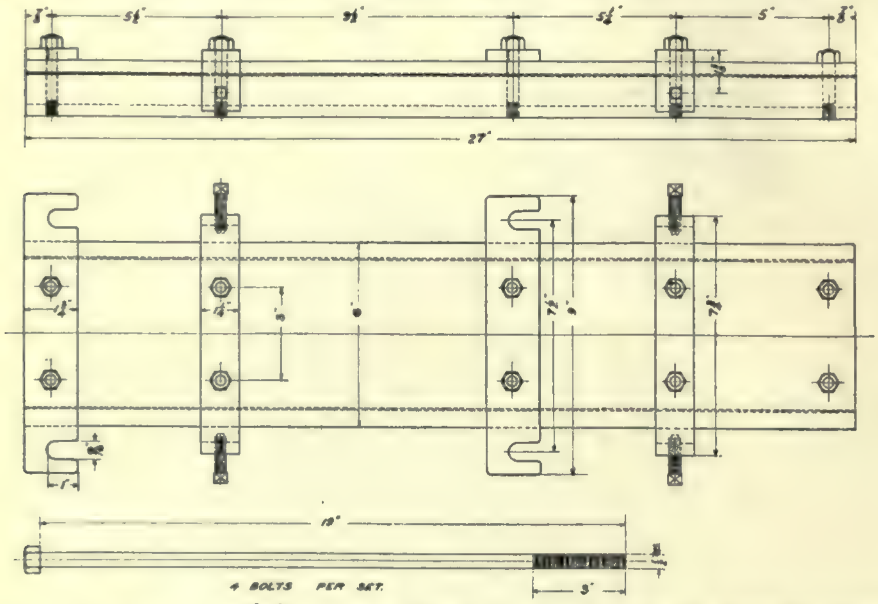
The piece A in this operation is held in three soft slip jaws B, bored out to fit the periphery of the piece, finished during the first operation. Before the piece is chucked, the taper bushing L is inserted in the hole for supporting the arbors in the facing heads. First, the scale is removed on all the outside surfaces by tool post tool N. The facing head on face 6 of main turret is then swung into position and, supported by arbor K, inserted in the bushing L, brings the piece approximately to size on the surfaces indicated by the cutters D, E. and F. Next the finishing head on face 3 of main turret is swung into place and the cutters D_1, E_1 and F_1 bring the surfaces indicated to the proper size, completing the operation.

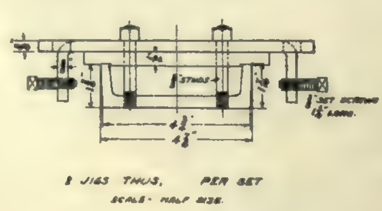
JIG FOR RETINNING CROSSHEADS.

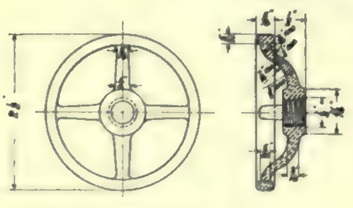
Various jigs have been used for retinning crossheads. The first were rather crude, consisting of a steel channel which fitted into the crosshead where the retinning is to be done. A small piece is turned at the top of the angle the thickness the metal is to be. The channel is kept in the centre of the part by sand. This is the crudest form and is not used in special railroad shops.

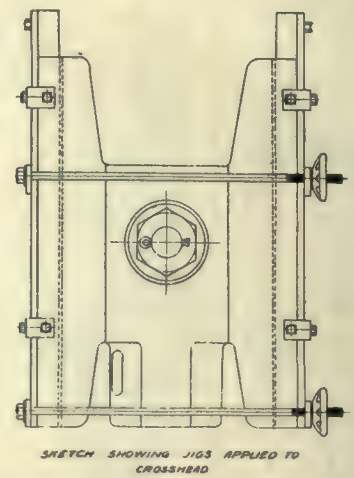
The next development is a side plate similar to the one shown, but without the bolts. Only one jig was used at a time. This style of jig has been used in some railroad repair shops.

The jig shown in the illustration is one used in the G.T.R. Stratford shops, and is an interesting device. Two jigs









Jig Used at G.T.R., Stratford, for Retinning Crossheads.

are used, one on each side of the crosshead as shown. By means of these four tie bolts the jigs are used to a standard width. The four ⅜-in. x 1½-in. long set screws shown on the side of the clamps, are used to have an even quantity of metal. The lower right-hand sketch shows the jigs applied to the crosshead. All the detail parts are shown in the other sketches.

STARRETT'S NEW TOOLS.

The attachment, Figs. 1 and 2, is made to fit the 12, 18 and 24-inch blades of Nos. 11, 23 and 33 Starrett squares, and can be used in connection with any of the regular rules as wide as an inch, or with flat steel square No. 21 for laying out key seats, etc.

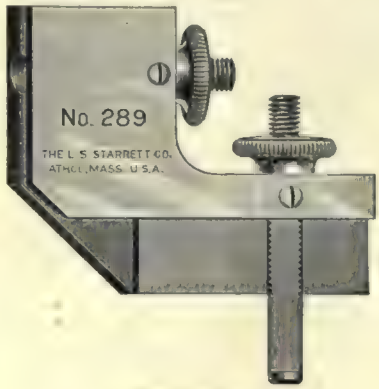


Fig. 1.—Attachment

Fig. 3 is a V block with a slot above the V, containing a flat spring to frictionally hold the centre gage parallel with the block. Placing the V block against a lathe spindle or face plate, a threading tool can be adjusted to line perfectly to cut both sides of a thread to the proper angle, eliminating uncertainty, for both external and internal work.

This gage, Fig. 4, is made of steel, drop forged, and designed with a view to getting different heights on a planer. The gage will measure from one-half to 5½ inches. It will also be found very convenient on other tools, such as milling machines where slots are being milled, etc. The gage can be inserted in the slot and by sliding the block on the

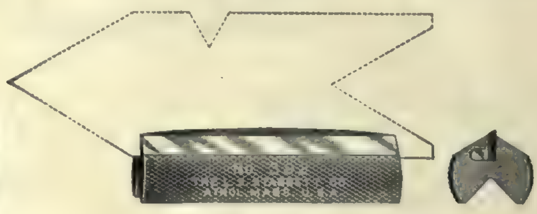


Fig. 3.—Center Gage Attachment.

wedge a perfect fit is given. Then the tool may be taken out and exact measurement obtained by use of a micrometer. When a certain close measurement is desired the tool can be set by the micrometer and used as a standard gage.

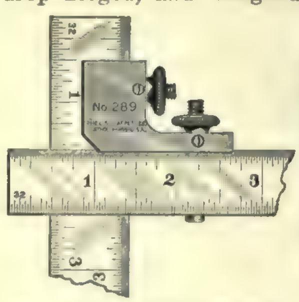


Fig. 2.—Attachment in Use.

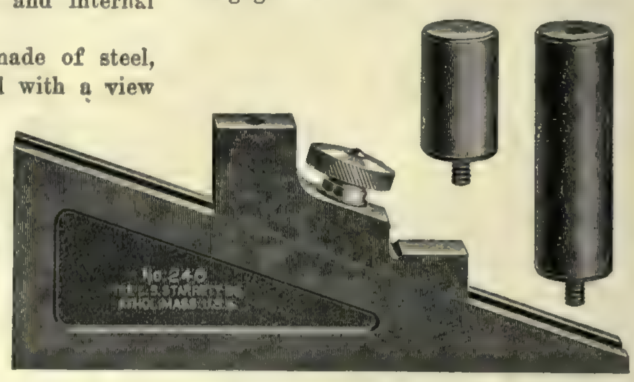


Fig. 4.—Planer and Shaper Gage.

These tools are made by L. S. Starrett Co., Athol, Mass.

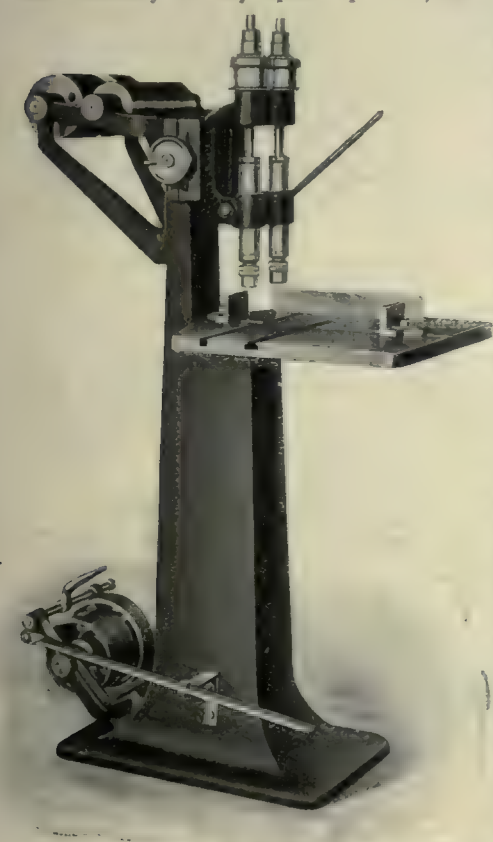
DEVELOPMENTS IN MACHINERY

New Machinery for Machine Shop, Foundry, Pattern Shop, Planing Mill; New Engines, Boilers, Electrical Machinery, Transmission Devices.

BAWDEN SENSITIVE DRILL.

The distinctive feature of this multiple spindle, sensitive, high speed drill is the method of relieving the spindles of the pull of the driving belt. The way this is accomplished is by having the pull come directly on the bearings. The upper bearings are right below the driving pulleys. The effectiveness of this construction is increased by the use of ball bearings.

The result of this construction is the retaining of the greatest sensitiveness and accuracy at any speed up to 4,000



Bawden Sensitive Drill.

r.p.m., the qualifications aimed at in the design of the machine.

The spindles are adjustable to centres by means of a hand wheel. One spindle can be moved to a width of 8" and drills can be made wider if desired.

The machine is manufactured by the Bawden Machine & Tool Co., 22 Orillia Street, Toronto.

UNDERWOOD BORING, TURNING AND FACING MACHINE.

This tool shown in the accompanying half-tone is designed principally for facing off the rivet heads on crank pins when it is necessary to remove the latter, but is also adapted to a wide range of other work.

This machine is easily set up and will cut out the metal in a neat manner. It is readily clamped to almost any piece of work and is then in position to bore, turn or face. It consists of a slotted crosshead which forms the base of the machine and a casing which contains a worm wheel having large integral hubs for resisting wear. Through the worm wheel the cutting spindle slides with a range of four inches. This feed is adjusted by hand. In the end of the spindle is a steel slide for the cutting tool and this is adjustable for different diameters by means of a feed screw, the maximum diameter being about 12 inches. Two slotted crossheads, which in the centre are cut V shape, clamp the work (the V's will take practically all sizes) and are pulled together by one inch through bolts. There are two adjustable spacing blocks threaded to receive each other and bored out which will straddle different diameter cranks, locomotive wheels or other work. Bolts pass through these blocks and clamp the machine proper to the crossheads.

The entire arrangement is very firm and solid and each piece being light in weight is easily handled by one man. The machine is quickly centred and has three changes of speed for heavy, medium or light work. These speeds are obtained by interchanging the gears shown on the driving shaft or by driving direct without them. The spindle is at right angles to the base or crosshead and by means of an extra facing attachment can be used for facing off pump or engine valve seats, it being immaterial whether or not the steam chest is solid or the valve seat several inches below the face of the chest. The machine may be driven by hand or any other suitable power.

This machine is manufactured by H. B. Underwood & Co., Philadelphia, Pa.

BLISS AUTOMATIC DOUBLE SLIDE PRESS.

The press illustrated on page 50 was designed to produce rapidly and accurately from ribbon stock, small sheet steel and sheet brass articles, the manufacture of which requires series of operations. The machine produces 180 finished blanks per minute, requiring a total of 1,460 operations per minute. The press performs eight operations at each stroke of the slide (after the first seven strokes) a finished blank being produced at each stroke. The elimination of all intermediate handlings, the saving in labor and shop room, and the entire absence of any danger to the hands of the operator are special features of this press. The top and bottob slides are operated by toggles driven by one shaft; the operation of this shaft being controlled by a friction clutch, by which means the press at any point of the stroke is always under the instant control of the operator. Another additional advantage of this type clutch is the fact that the press can be stopped or started while the feed is on its point

Underwood Boring, Turning and Facing Machine.

of dwell, which is not the case where the conventional positive press clutch is used, due to the fact that presses so equipped stop on the top centre while the feed is at its highest speed and must necessarily stop and start with a certain amount of shock which has a tendency to strain the feed mechanism In cases where ribbon stock is being fed this also causes some slip of the ribbon with a consequent irregularity in the feeding.

The top and bottom toggle connections are each independently adjustable, enabling the changing of the timing of the operations. In this way the press may be adjusted so that either the top or bottom slide may finish its stroke first and then dwell until the

Fig. 1.—Front View Bliss Automatic Double Slide Press.

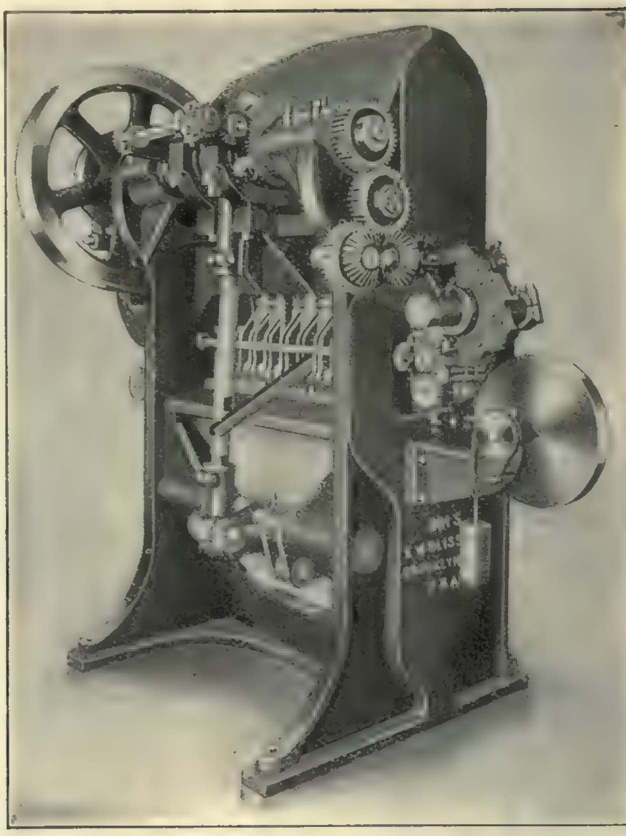


Fig. 2.—Rear View. Showing Feed and Stock Reel.

other side continuing performs the operation, the movement of the slides in relation to each other depending on the nature of the operation to be performed. The feed is actuated by a 6-point Geneva stop motion which feeds 120 degrees and provides an ideal motion for a feed of this class. There is provided for the stock a reel with a friction holdback, and for the scrap a reel with geared drive arranged with a compensating device, insuring uniform tension on the stock, regardless of the amount of scrap on the reel. The dies are each in a separate and independent sub-press and can readily be removed and replaced any number of times without the slightest danger of shearing the most delicate dies.

The stock used being in ribbons or strips of suitable width, is used as a feeding medium, and in this way a very high rate of speed is attained. The stock passing from left to right the entire width of the press, is controlled by a set of rolls on each side of the press.

In the case of work requiring drawing operations, the drawing is done previous to the blank being taken out of the ribbon, thus allowing the metal to contract in every direction. To provide for this contraction and the consequent change in centres, the dies are arranged in the independent sub-presses which permit of adjusting the distance between the centre dies, to match the distorted spacings due to the drawing operations.

This press was recently designed and built by the E. W. Bliss Co., 20 Adams St., Brooklyn, N.Y.

NEW MOLDING FLASK.

Louis W. Daman, of the Enterprise Foundry staff, Sackville, N.B., has been granted patents in Canada and the United States for an improved form of molding flask, which, it is claimed, will lessen the cost of manufacturing in foundries and will also help to increase the output. The new system made possible by the Daman flask will be applicable in all branches of foundry practice.

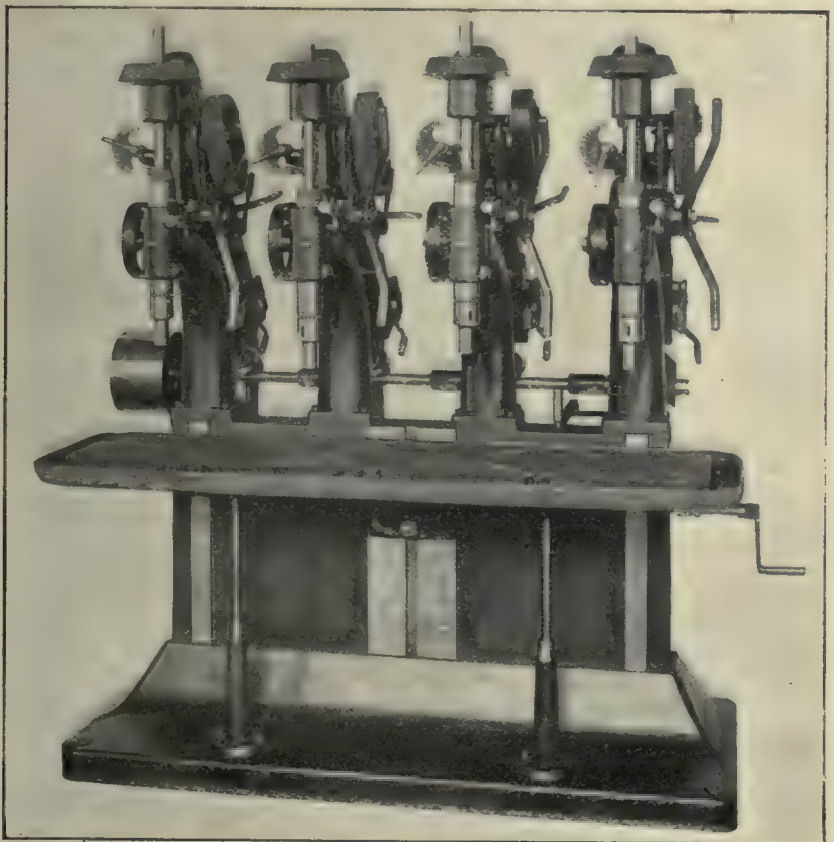
With the present foundry flask it is necessary to have a wooden or iron flask for each mold required excepting in bench molding, which is limited to a very small size. For instance, if a molder was capable of making 30 molds of a given size per day he would require 30 wooden or iron flasks. With this new system the number of molds possible is unlimited; all that is required is one flask and four or five jackets. The jackets are to be shifted from one mold to the other until all the molds have been filled. With the jacket in place and clamped down to the bottom board there is no chance for a run-out or strain on the castings, for there is nothing to yield to the pressure of metal while it is being poured. This is one of the many faults found with the present foundry flask.

Wooden flasks, which are mostly used, soon wear out, or twist and become weak. The loss from strain and run-out and burning of wooden flasks is great. On the other hand, cast iron flasks are too heavy to handle quickly and the breakage is a great expense. Very often, too, a change in a pattern will make them useless. With the new system a great variety of castings can be made without any change in the system outside of a possible change in the bars. For instance, in the stove business, it is necessary to have 36 flasks to make one ordinary No. 8 cast iron range. If the business demands 20 ranges per day the foundry must have 720 flasks at about $3 each; with this new system it would require about fifteen flasks and 75 jackets only to make all the 20 or more complete stoves per day and a variety of other patterns.

To find the weight of castings, multiply the cubic inches by 0.27 for iron, 0.29 for steel and 0.30 for brass.

ALL GEARED 20-INCH GANG DRILL.

The Four Spindle Machine here shown embodies the same principles of construction that are characteristic of the All Geared 20-Inch Upright Drill. There are no cone or feed belts. Each spindle has four changes of geared speeds or eight changes when back geared. Each spindle has Positive Power Feeds, ranging from .001 inch to .025 inch, controlled by the small lever on the ratchet faced segment conveniently located as shown in cut. All changes of speeds and feeds are made instantly by the operator from front of the machine without stopping the spindle, and no stopping is necessary to throw back gears in or out.



Barnes All Geared 20-inch Gang Drill.

There being no cones while all four spindles are driven by a single shaft, yet any spindle may be instantly stopped by moving speed changing lever on center, thus throwing transmission gears out of mesh. The drift hole is placed below the sleeve so when spindle is stopped the tool may be drifted.

Single table with oil channel as shown is furnished with this box column type of gang, and table is supported by two screws, making a rigid and thrust, so that when clamped, the table does not spring under heavy work. Table is raised and lowered by means of crank at one end. When desired the Gang may be furnished with independent columns (having separate tables, either round or square) set on heavy bed base.

For tapping any or all spindles may be furnished with reversing friction clutches. Right hand spindle of the Four Spindle Machine shows same so equipped.

The spindle is double splined and fitted with No. 3 Morse taper or when so specified No. 4 taper will be furnished Each spindle will drill to center of a 20-inch circle.. Vertical travel of spindle, 10; vertical travel of table, 14; greatest distance from spindle to table, 27; floor space, Four Spindle Machine, 40 x 82; Speed of tight and loose pulleys, 400.

This machine is manufactured by the Barnes Drill Co., Rockford, Ill.

NATIONAL DIE SHARPENER.

This machine is intended for sharpening bolt cutter dies, giving them the proper entrance and correct clearance. It will sharpen any size or type of threading die.

A 6-inch wheel is used, which can be redressed to 3½ inches without affecting the machine's operation. A suitable chart is furnished for making the necessary settings for various diameters, and may be changed from one size to anoter.

This new die sharpening machine was recently brought out by the National Machinery Company, Tiffin, Ohio, manufacturers of bolt and nut machinery.

National Die Sharpener.

A FINE DESCRIPTION.

Under the above head the Daily Beacon of Stratford, makes the following reference in regard to the articles on the Stratford shops, which appeared in the April issue of Canadian Machinery.

"The April number of Canadian Machinery and Manufacturing News, published by the MacLean Publishing Company, Toronto, contains a number of articles on the new Grand Trunk locomotive shops in this city, which must be ranked as the best yet published. In addition to the features described by the local and other newspapers there are articles on the equipment of the machine department, with description of the machines, on the power house equipment, on the system of looking after tools, etc. and on the driving wheel quartering and crank-pin turning machine. These are, of course, written with technical knowledge which gives them special value to machinists. Interior views of the shops and of different machines in addition to those already published by other papers also embellish these articles, the production and publication of which is exceedingly creditable to the journal in which they appear."

CANADIAN MACHINERY AND MANUFACTURING NEWS

A monthly newspaper devoted to machinery and manufacturing interests mechanical and electrical trades, the foundry, technical progress, construction and improvement, and to all users of power developed from steam, gas, electricity, compressed air and water in Canada.

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Vol. V. MAY, 1909 No. 5

CANADA'S IRON AND STEEL PRODUCTION.

Although the pig iron and steel returns for Canada for 1908 show a decrease over the figures for the previous year, it cannot be said, considering the restricted buying of the railroad and other large concerns, that the falling off was very remarkable. Last year was not a good year for iron and steel in any country. In the States there was a considerable reduction of output, lower prices, and a general slow consumption. It is evident from the fact that Canadian pig iron production was only 25,000 tons less than the previous year's total, that we did not feel the general setback so acutely as our neighbors, and in addition producers held the prices more firmly.

It is interesting to note that the total output of finished steel for the second half of last year showed an increase of 43 tons over the first half, proving that buying improved towards the end of the year. Although many authorities claim that copper now reflects more accurately trading conditions, there is no doubt that the pig iron and steel returns are still the best barometer of the trading of the country.

According to unpublished returns gathered by Canadian Machinery from six large producing corporations in Canada, the total production of pig iron in Canada for 1908 was 556,044 tons which compares very favorably, considering conditions, with the amount returned for 1907, which was 581,146, a decrease of about 25,000 tons. Of this total for last year, basic comprised 155,-734 tons, foundry 170,388 and bessemer 155,734. Comparing the figures for the first and second half of the year the totals were 281,329 tons, against 274,715, a decrease for the latter term of 6,614 tons.

The returns from eight companies making steel showed an output of ingots, etc., of 558,763, compared with 706,982 in 1907, a decrease of 148,219. The total output of finished steel, comprising rails, bar steel, railroad spikes, rods, plates, etc., was 538,842 tons. The first half of the year produced 247,803 tons, and the second half 291,039, an increase for the second term of 43,236 tons.

The total tonnage of rails amounted to 268,159 blooms to 153,541, finished rolled iron and steel 45,411 and castings, 9,676 tons.

FOUNDRYMEN'S CONVENTION.

The eyes of all foundrymen will be on Cincinnati, O., during the week of May 17-22, since at this time the leading associations of this industry will be in convention there. The American Foundrymen's Association and the American Brass Founders' Association meet from May 18 to 20; the American Foundry Foremen's Association on May 17 and 18; and the Foundry and Manufacturers' Supply Association, May 17 to 22.

These meetings will be occupied with the educational features of the foundry business exclusively. Interesting and instructive papers will be read at all the meetings, and the benefits to be derived by those attending will be invaluable. Not the least instructive part of the programme will be the exhibitions of the Foundry & Manufacturers' Supply Association. Practically all the leading manufacturers and dealers will show the latest devices for increasing efficiency and decreasing cost in the various foundry departments. As many Canadian Foundrymen as possible should attend. A close study of the apparatus shown will be a liberal education, and the knowledge thus gained will make the trip well worth the effort.

GET READY.

This isn't a sermon; we have no inclination to get into a pulpit and listen to ourselves talk but we do want to be of assistance to our readers. The inspiration for this chat came from a conversation we had with one of the big practical men in what are perhaps the largest shops in Eastern Canada. We asked him if there were many instances where a boy or man had been promoted and had "fallen down" on his new position, necessitating either a return to his old job or seeking new quarters. The answer we got was that it frequently happened, and the reason was given: "He wasn't ready." A man may be an expert in one grade of his work and may impress his employer with the fact that he is equal to increased responsibilities, with the accompanying increase in pay, but, unless he is prepared, unless he is ready for the promotion he will "fall down" nine times out of ten. The tenth man is one who is clever enough to get ready after he has his promotion, and there are very few of these.

A splendid way to get ready is to keep well posted with the developments in your trade, and to keep a tangible record of these developments because no one can keep them all in his head. A good way to do this is to subscribe to and read one or two good monthly technical papers. A more expensive way is to take a course either at a night school or through a correspondence school.

The excuse is sometimes given that one has no time for the technical papers. One half hour every other day will do wonders and there are few who cannot afford this much attention to their advancement. Above all things keep notes. This is one of the most helpful of all the plans to get ready. When you see a new way of doing a thing, make a note of it; when you read some interesting article relative to your line of work cut it out and paste it in your note book. An engineer-

ing notebook is a valuable asset and they cannot be compiled in a short time. It took years to gather together all the information in notebooks like Kent's or Trautwine's or Suplee's. If a question arises that is hard to find an answer to send it into your technical paper, they have mines of information available out of which to find the answer to your question. If you have done something some other way than somebody else has, write about it to your technical paper. They will remunerate you and, in publishing it, maybe help a reader out of the same difficulty. Writing your ideas makes you fluent, enables you to make yourself clear to others, is an assistance in getting ready, and the main thing is to get ready for that promotion when it comes along.

DEVELOPMENT OF HIGH-SPEED STEEL.

The rumblings of the "startling" disclosures made by Professor Arnold of Sheffield University, to an audience at the Royal Institute, have not as yet died away. The immediate result of his announcement was the extensive advertising that one firm got and that firm only. As a matter of fact the experiments with this steel were being carried on simultaneously by all the leading Sheffield steel firms, not by one exclusively. These makers were not publishing any announcement as to progress for a very good reason, namely that there were already on hand, huge stocks of tool steel worth approximately a million dollars which would be very sadly depreciated by the announcement of a metal superior in almost every way, as this new steel seems to be. As a result of the announcement a serious loss of business has been reported from Sheffield from the countermanding of existing orders for the old steel, and the holding back of contemplated orders pending more definite details of the new metal. It was not surprising therefore to hear a storm of protest from the makers and holders of these stocks of the "old" steel.

The new steel is not a revolution, but the natural outcome of continuous experiments tending to the improvement of existing tool steels. Makers know enough of the mysteries of high-speed steels to make special steels for special uses—that is if the purchaser will pay the extra cost. The ordinary high speed steels will not be driven from the market very easily, so long as makers continue to improve them without boosting the prices too high.

Now that the cat is out of the bag, so to speak, machinery users, makers and dealers will be interested in watching the effect that the new steel will have on existing machinery and the designs of machines to come. It is not such a great while ago that the machine tool design was reorganized to meet the requirements of the discovery of high speed steel and now we have another "discovery" which seems to call for a still greater advance in machine tool design. It's a wonderful age we are living in and of all the branches of industry, that of machinery is probably the greatest of them all. It has come to the point where we look through our papers (daily and technical) and are only surprised when we do not "discover a new discovery."

DON'T BLAME THE MACHINE.

Frequently a salesman, when going back to customers who have purchased machines or an engine from his house, will be confronted with the tale of woe that "the machine doesn't work right" etc. They consequently blame the machine first thing, without giving a thought to the consideration of hurtful outside agencies. These outside causes of dissatisfaction sometimes are very simple to remove and in one case which has been brought to our attention, the trouble was caused by graft, pure and simple. The oil that was being used was delivered under a false name as to quality, and was absolutely of no use for the purpose for which it was intended. Although attention was called to this fact, the purchasing continued. Why? Because "somebody" was making a "good thing" out of it with little or no regard to the welfare of the machines upon which the oil was used nor the quality of work done by the machines.

Now, there can be no blame attached to the machines in these cases, no more than to the horse which does poor work on a diet of nothing but water. The fault lies solely at the door of those who purchase regardless of requisitions prepared by the men-in-charge, who know what they need.

Engineers and machinists should therefore be on the look out for this sort of "grafting" and expose it at once, because it is on them that it reflects. The engineer gets decreased efficiency in his plant and the machinist decreased output or an output of lesser quality. All concerned would be infinitely better off if this method of purchasing could be wholly eliminated and one of the most effective ways to start this elimination is to begin at the bottom and fearlessly expose the smallest attempt at purchasing "bad" under the guise of "good."

TOPICS OF THE MONTH.

Many improvements in machine tools and equipments have been noted during the past few months. Others are still under way. This has been one of the beneficial results of the recent trade depression.

* * *

The German-Canadian Economic Association will send delegates to Canada this summer for the purpose of promoting closer trade relations. Commissioners are also to be sent to Canada by German newspapers. Besides discussing with Canadian Ministers the advantages of greater commercial intercourse between the two countries, the delegates, who are to be representative German business men, will inform the Canadian public of plans systematically working up a German demand for Canadian products, the Economic Association aiming to be of mutual service to German and Canadian mercantile interests. If Germany would concede to Canada the same terms given to France, it would mean the opening up of a good German trade.

* * *

The campaign to eliminate the V thread from taps and dies is meeting with approval on all sides in United States and Canada. In our April issue the question was taken up and since then several comments have been received. The pioneers in the movement for abolishing the useless V thread were Butterfield & Co., Rock Island, Que. The old and inferior V thread soon gets dull and tears the piece it is tapping and destroys the whole tap. The thread of the V is too deep in proportion to the diameter of the tap, to withstand hard work. The U. S. standard gives 25 p.c. greater factor of safety and this difference is added to the shank and ensures working strain. The user can get tools from any manufacturer with a standard thread. The Whiteworth is a still better thread but chasers are expensive and hard to make. The thread is stronger and wears longer. A mechanic can easily make a U. S. chaser and therefore it is less expensive than the Whiteworth. Users will certainly find it to their advantage to adopt U. S. standard thread taps and dies.

For Manufacturers. Cost and Efficiency Articles Rather Than Technical.
Steam Power Plants ; Hydro Electric Development ; Producer Gas, Etc.

The Individual Motor Drive for Machine Tools

Treating of the Economy of Individual Motor Drive and Illustrating Various Lines of Machines to which Motors have been Applied.

The use of the individual motor to drive machine tools is coming into greater prominence. The use of belt, chain, rope drives in group drives have

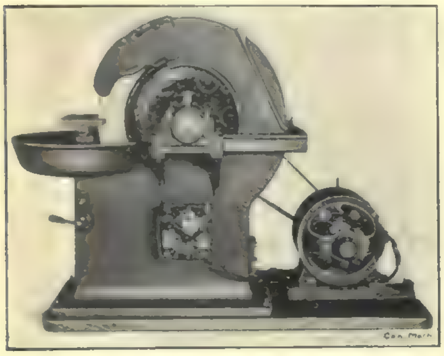


Fig. 1.—Motor Driven Emery Wheel.

their fields of usefulness and when a large number of machines are used at same speed, group drive is preferable. Single motors have an advantage of allowing machines to run at their maximum cutting speed. In this connection the direct drive of individual motors has a direct motive power.

Another feature of the direct drive which commends itself in times of heavy output in manufacturing plants is the ease with which several motors direct-connected to tools can be set up temporarily in a distant part of a shop to handle some rush job that cannot be taken care of in the regular departments.

In regard to the equipment of old tools with electric driving, it is no doubt somewhat cheaper to use the group method, but the application of the individual drive to the old tool is now a comparatively easy problem on its technical side, except where a very great range in speed is required. The recent development of the commutating pole motor enables most cases of forcing the production rate of old tools by separate motor application and the use of high-speed steel to be handled with success.

In a paper and discussion before the National Association of Box Manufacturers at a recent convention, Messrs. F. M. Kimball and L. R. Pomeroy, of the General Electric Company emphasized a number of points which have a direct bearing upon the general problem of electric driving, so that a brief reference to some of these may be consistent with the present survey. One point especially emphasized by Mr. Kimball was the ease with which a check can be kept upon the condition of the tools or machines when driven by direct-connected motors. Wood-working tools, in particular, when out of alignment or carrying dull cutters, may easily absorb 200 per cent. more power than they normally require, and this excess power is not only wasted, but is absorbed in friction and strains which are damaging to the machine. Under such conditions the niceties of adjustment are disarranged and the performance of the machine is liable to permanent injury. By placing an indicating wattmeter in circuit with the motor and observing its reading when the driven tool is known to be in perfect adjustment and alignment, with the cutters in good order, and comparing that reading with subsequent readings from time to time, an abnormal use of power is at once made known and corrective measures may be applied in time to prevent serious injury.

Two distinct systems of distribution are possible, alternating and direct current. There are synchronous and induction motors in the alternating current system. Though some of these are used on machinery they are not so suitable as direct current machines for individual drive.

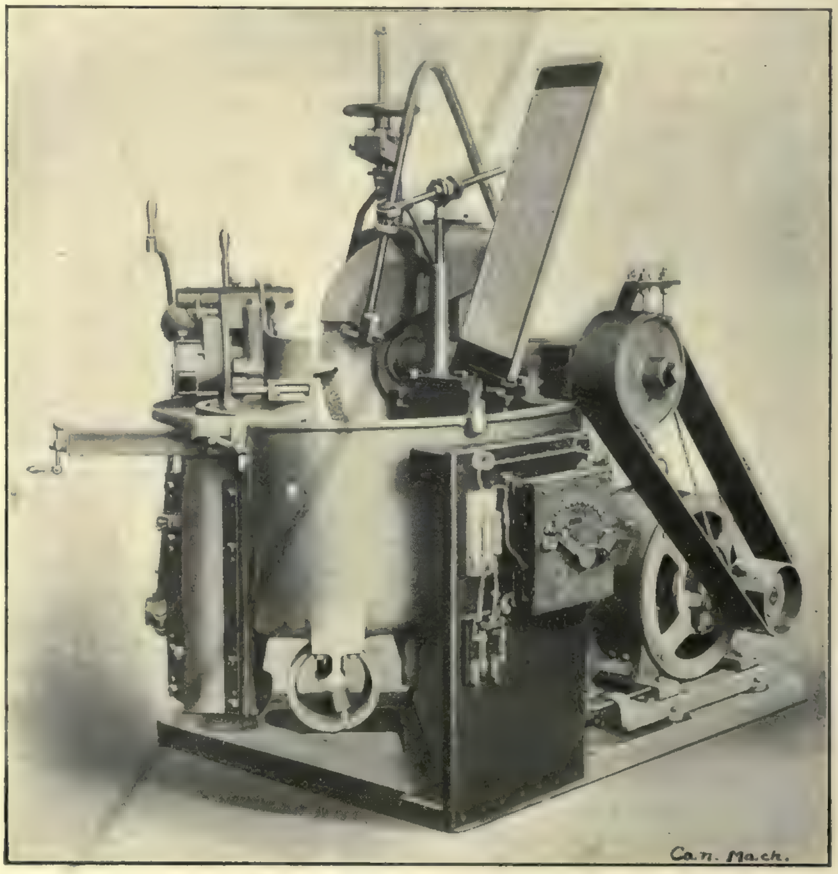


Fig. 2.—Sellers' Motor Driven Grinder.

The direct-current system offers three kinds of motors, the combined characteristics of which cover much more closely the requirements of machine tool drive than do those of the alternating-current

motor. These are the series-wound, compound-wound, and shunt-wound motors.

The series motor is a variable-speed and is an excellent motor for cranes elevators, etc. The shunt-wound motor is most suitable of any for the purposes of machine-tool driving, and either singly or in combination with each other or in combination with gearing, most of such work is now accomplished.

Electrically Driven Tool Grinder.

Perhaps among the first of the equipment in a machine shop to be driven by an individual electric motor in experimenting with electricity as a motive power, is the tool grinder, because it combines so many of the various advantages of electric drive. Tools are sharpened only at intervals and the load is fluctuating, permitting the outfit to be shut down between jobs and also to take advantage of any decrease in the demand for power. As a grinder has often to be located somewhat apart from the rest of the machinery, it becomes difficult to make the necessary belt connections where a mechanical transmission system is used. With a small motor supplying the power the grinder may be located at any point that convenience demands and the wires run to it without trouble.

The Safety Emery Wheel Company, of Springfield, O., is supplying a 36-in. x 4-in. emery wheel such as is illustrated in Fig. 1, equipped with a standard Westinghouse direct current type "S," 4 h.p. motor. The motor runs at 1175 r.p.m. and drives the emery wheel at 450 r.p.m. The starting device for the motor is directly on the grinder, providing the most convenient method for bringing the wheel up to speed.

The illustration shows a constant speed shunt motor, but the use of an adjustable speed motor is recommended, as the speed may be increased to allow for wear of the emery wheel.

It will be noted that the motor is mounted well out of the way on the extended sub-base of the grinder, and therefore forms a very flexible outfit in that it may be moved as a unit. Two operators can work on the grinder at the same time, as a door provided in the hood in the rear allows grinding there as well as in front. Wator is prevented from splashing over the floor or the motor by the wide pan in front and the apron in the rear.

Wm. Sellers Motor-Driven Grinder.

Fig. 2 is an electrically-driven Wm. Sellers, Philadelphia, universal tool grinder which will grind all manner of cutting tools except those with concave curves and re-entrant angles less than a right angle. It is shown driven by a $7\frac{1}{2}$ h.p. direct current, constant speed type "S" motor of Westinghouse manufacture, running at 975 r.p.m. The motor is mounted on the sub-base of the grinder, and a starting rheostat with fuses and switch is also mounted by the side of the grinder, resulting in a most compact and convenient equipment.

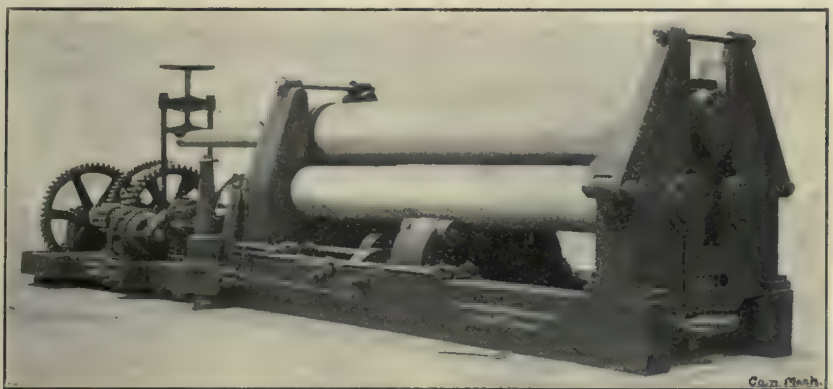


Fig. 3.—Motor Driven Plate Rolls.

A rotary pump driven by the motor forces water to the tool being ground through a system of jointed pipes ending in an adjustable nozzle, furnishing a large volume of water at a low velocity. This arrangement is so made as to prevent the water from splashing and keeps it away from the working parts.

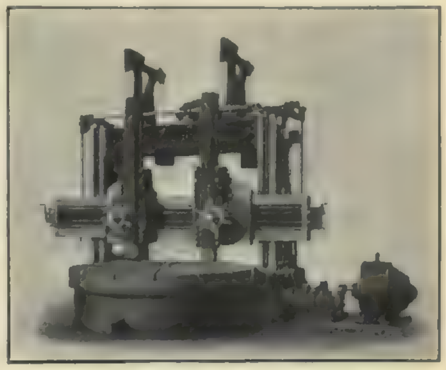


Fig. 4.—Motor-Driven Boring Mill.

Motor-Driven Boiler Plate Rolls.

Fig. 3 is of a boiler plate rolls built by the John Bertram & Sons Co., Dundas, for the Marine and Fisheries Department for the Sorel shipyard. One of the stipulations in the contract was that the rolls should be entirely Canadian manufacture.

The capacity of the machine is a plate $1\frac{1}{2}$ in. thick by 12 feet wide; clearance between housings 12 ft. 4 in.

The machine is so constructed that a plate can be bent to a complete circle and removed by throwing down the hinged parts of the housings, which can be plainly seen in the illustration.

The forged steel rolls were made by the Hamilton Steel & Iron Co., the combined weight of which is 42,000 pounds. The cast steel driving gears were also furnished by the Hamilton Steel & Iron Co. The other forgings used in the con-

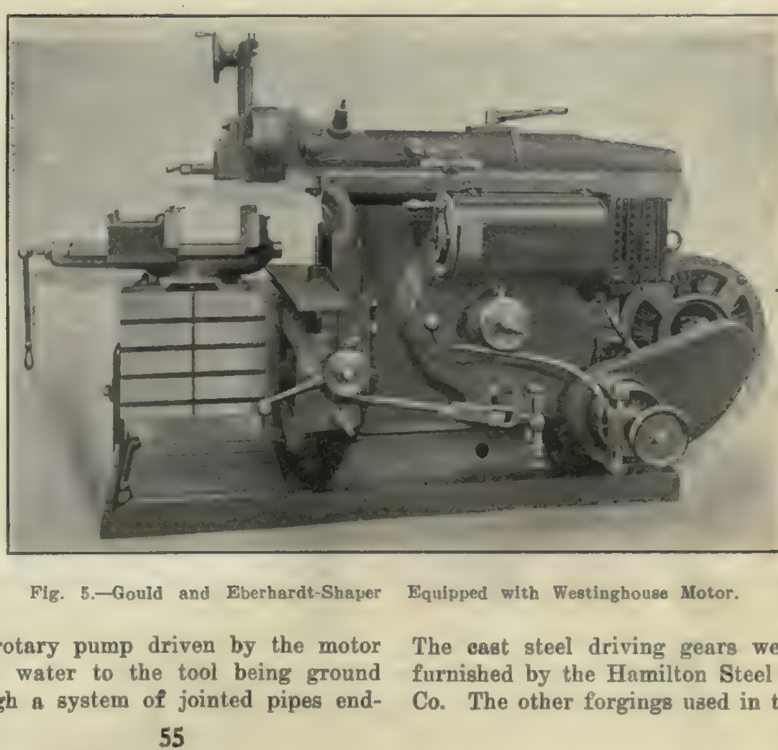


Fig. 5.—Gould and Eberhardt-Shaper Equipped with Westinghouse Motor.

struction of the machine were furnished by the Canada Forge Co.

The machine is motor driven by a 40 h.p. Canadian General Electric variable speed induction motor. For raising and lowering the top roll a 10 h.p. induction motor of same make is used.

Motor-Driven Boring Mill.

The motor-driven boring mill shown in Fig. 4, is a 104 in., manufactured by the London Machine Tool Co. Hamilton. This mill is operated by two D.C. motors. One is connected by gearing to the driving mechanism and the one for raising the cross rail is located on the top of the frame.

Motor-Driven Shaper.

The half-tone, Fig. 5, shows an individual motor-driven shaper connected through a friction clutch so that the machine can be stopped independent of the motor itself. The tool is a 34-in. high duty shaper.

Connection between the motor and the shaper is made by a silent-running chain drive protected by a chain guard. The motor is conveniently located on the rear of the shaping housing which makes the outfit a most compact unit free to be located at any point in the shop. The use of the adjustable-speed motor with this wide speed range does away with the necessity for mechanical speed changes, and gives a greater number of steps than is possible by other methods.

The clutch and brake device is controlled by the long curved lever, shown below the controller. By means of this the shaper may be stopped quickly without stopping the motor. This saves time and lessens the wear and tear on the motor which would rseult if it were necessary to stop and start the motor for every little adjustment. The controller is conveniently located, and all the movements are controlled within easy reach of the operator. The shaper is manufactured by Gould & Eberhardt Newark, N.J., and the motor is a direct-current, adjustable-speed, type "SA" Westinghouse, 5 horse-power. The speed may be adjusted by a drum controller over a range of 400 to 1,600 r.p.m. in a series of 15 forward and six reverse steps. The latter are provided for use in making the preliminary adjustments where it may be necessary to reverse the motion of the ram.

Motor-Driven Table Saw.

A tool for wood-working establishments which is convenient and efficient is the motor-driven table saw manufactured by the Crescent Machine Company, Leetonia, Ohio, illustrated, Fig. 6.

The saw table proper and the saw itself are supported upon a pedestal which also furnishes a frame upon which the mechanism for adjusting the saw and table, and the starting rheostat are mounted.

This adjusting mechanism consists of means for tilting the table and raising or lowering the saw. The former is accomplished by means of a hand-wheel whose shaft bears a worm, with a graduated brass scale and pointer to show exactly the amocnt the table is tilted up to 45 degrees. By means of the other hand-wheel the saw is adjustable in a vertical direction, making the machine adapted for cutting boards of different thicknesses up to 4 inches. The saw itself may be as large as 14 inches, but no larger.

The motor equipment consists of a 3¾ h.p., totally enclosed Westinghouse type "R" motor and a starting rheostat. It is a shunt wound, direct current motor, running at a constant speed of 1,800 r.p.m. on a line voltage of 220 volts. The type "D" rheostat is equipped with an automatic low voltage release and is used for starting only.

The motor is mounted on the extended base of the saw table proper. It is belt

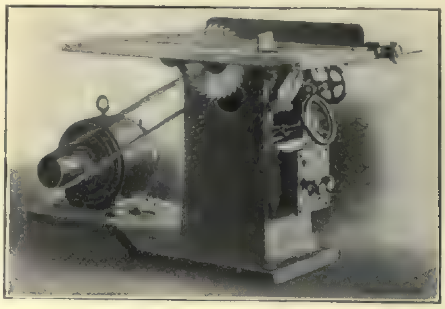


Fig. 6.—Motor Driven Table Saw.

connected to the saw mandrel by a belt which passes through an opening at the back of the pedestal.

A reference to Fig. 6 shows the extreme ease of operation brought about by the motor equipment. The five operating handles are all within a radius of about one foot. The table can be tilted, the saw raised or lowered, the ripping and cut-off fences adjusted and the saw started or stopped without the operator moving a step. The motor is behind the machine out of the way and takes up no space that would otherwise be useful, being beneath the overhanging table. The machine can be located in any position desired, being independent of line shafts. The minimum amount of power is wasted, nothing being consumed by extra belts, countershafts, etc. It should be further noted that a saw of this kind only operates intermittently and the absence of a main shaft and countershaft is thus particularly advantageous, since power is only used when work is actually being done. Altogether, this constitutes a fitting example of the advantages of the motor-drive.

TORONTO POWER RATES.

Following is the schedule of prices to be charged by the Toronto municipal power plant to consumers of over 300 horse power:—

Primary current, alternating 3 phase, 25 cycle, 12,000 to 13,000 volts. 24-hour service.

Maximum Demand in h. p.	Minimum Monthly Bill.	Flat rate per h. p. per month.	—Meter rate per h. p. Hour— Off Peak	On Peak.
300 ..	$344 00	$2 29	$0 71	$0 06
400 ..	425 00	2 12	0 65	0 06
500 ..	506 00	2 02	0 62	0 06
600 ..	588 00	1 96	0 60	0 06
800 ..	750 00	1 87	0 58	0 06
1,000 ..	912 00	1 82	0 56	0 06
1,200 ..	1,075 00	1 79	0 55	0 06
1,500 ..	1 320 00	1 76	0 54	0 06
2,000 ..	1,725 00	1 72	0 53	0 06

Customer may choose either flat rate or meter rate. Rates quoted are net.

Horse-powers intermediate between quotations to be charged the higher of the two nearest rates and to carry a minimum monthly bill pro rata to such intermediate horse-power.

Term of agreement not less than five years, with privilege to customers of changing his monthly guarantee within the limits of this schedule once during first 12 months, and thereafter at 12-month intervals.

Service is to be taken subject to the general rules of the department.

Peak hours are as follows:

October 15 to October 31, 5.30 p.m. to 6.30 p.m.

November 1 to November 30, 5 p.m. to 6.30 p.m.

December 1 to January 15, 4.30 p.m. to 6.30 p.m.

January 16 to February 15, 5 p.m. to 6.30 p.m.

February 16 to March 1, 5.30 p.m. to 6.30 p.m.

Mr, Richard Wallace, late superintendent of the Buffalo Structural Steel Company, has been appointed superintendent of the new bridge shop of the Manitoba idge & Iron Works, Limited, of Winnipeg. Mr. Wallace has a wide experience as superintendent in several of the large American shops in the manufacture of railway bridges and steel structures and will no doubt, be an important factor in developing this business at Winnipeg.

FOUNDRY PRACTICE AND EQUIPMENT

Practical Articles for Canadian Foundrymen and Pattern Makers, and News of Foundrymen's and Allied Associations. Contributions Invited.

ANNUAL CONVENTION OF A.F.A.

The coming convention of foundrymen, to be held in Cincinnati during the week of May 17, promises to eclipse all previous efforts both as to profitable discussion of foundry practice and exhibits of up-to-date appliances.

The headquarters of the American Foundrymen's Association will be the Sinton Hotel, 4th and Vine Sts., while the Grand Hotel, 4th and Central Ave., will be the headquarters of the Associated Foundry Foremen.

Music Hall, located at 12th and Elm Sts., has been secured for the exhibit, which will be held in the south wing known as Horticultural Hall. The great exhibition of working foundry machinery and equipment prepared by the Foundry and Manufacturers' Supply Association, and under the able guidance of Mr. C. E. Hoyt, who is secretary of the Foundry and Manufacturers' Supply Association, and also the Associated Foundry Foremen, will be open the entire week.

Arrangements have been made by the Associated Foundry Foremen of Chicago and vicinity for transportation accommodations for those desiring to attend. Other organizations including the Milwaukee Association and the Tri-City Association of Rock Island, Davenport and Moline, have signified their intention of sending delegations to accompany the Chicago members.

The past year has witnessed many changes in foundry practice, improved molding machines and equipments, which have reduced foundry costs very materially. Many melting furnaces have been introduced recently and these and many other improved lines will be exhibited at the Cincinnati convention.

Convention Program.

Tuesday, May 18, at 2 p.m.

Address of welcome.

Address by Lawrence L. Anthes, President A.F.A. Address by Chas. J. Caley, President American Brass Founders' Association.

Reports of committees A.B.F.A. and A.F.A.

Tuesday evening is "Get Together Night" at Hotel Sinton and is for visiting foundrymen and their lady friends.

A.B.F.A. Wednesday May 19, at 10 a.m.

The following are the papers to be presented: "The Manufacture of Brass Ingots, their Uses and Advantages," by W. M. Corse; "The Use of Waste Heat," F. W. Reidenbach and "The Patent Situation in the United States," C. H. Clamer.

Papers of the A.F.A., 10 a.m.

"The Cost of Steel Melting in Foundries," Dr. Bradley Stoughton, illustrated with lantern slides; "The Side Blow Converter for Steel Castings and its Operation," J. S. Whitehouse; "Open Hearth Methods for Steel Castings," W. M. Carr; "Notes on Air Furnace Construction for Malleable Castings," W. H. Kane; "The Use of Pulverized Coal for Foundry Purposes," R. K. Meade; "Molding Machines versus Hand Molding," Geo. Muntz; and "Pattern Shop Equipment," A. N. Spencer, illustrated with lantern slides.

Papers of the A.F.A. 2 p.m.

"The Heart of the Foundry as Seen by the Foundry Engineer," D. S. Hawkins; "Cores and Core Making," F. K. Cheney; "Continuous Melting in the Foundry of the Westinghouse Air Brake Co.," S. D. Sleath; "Continuous Melting," R. H. Probert; "The Permanent Mold," E. A. Custer, illustrated with moving pictures showing the production of castings in permanent molds; "The Practical Value of Chemical Standards for Iron Castings," Dr. J. J. Porter; and "Pyrometry in the Annealing Room," S. H. Stupakoff.

Papers of the A.B.F. 2 p.m.

"General Principles of Operation of Industrial Pyrometers," C. H. Wilson; "Notes on Brass Melting," Chas. T. Bragg, and "Melting of Brass Turnings in the Oil Furnace," E. H. McVeen.

Papers of A.B.F.A., Thursday May 20, at 10 a.m.

"Electrolytic Assay of Copper," Geo. L. Heath; "A System of Distributing Waste Losses in Raw Materials to the Cost of the Finished Product," L. W. Olsen; and "The Tensile Strength of Zinc-Aluminum Alloys," W. D. Bancroft.

Papers of the A.F.A. at 10 a.m.

"A Comprehensive Foundry Production Tally," C. E. Knoeppel; "Foundry Costs," B. C. Franklin; "Specifications for Foundry Facings," H. F. Frohman; "Foundry Transportation Methods," David Gaehr; "Modern Cupola Practice," J. C. Knoeppel; and "Use of Steel Scrap in the Cupola," C. R. McGahey.

The business session of the A.F.A. and A.B.F.A., for the election of officers, will be held in separate halls at the conclusion of the morning session.

Thursday Afternoon and Evening.

Boat ride on the Ohio river and barbecue at a noted Kentucky pleasure resort.

The Music Hall, Cincinnati where the Foundry Supply Exhibition will be Held.

The Exhibitors and Exhibits.

OSBORNE MANUFACTURING CO., CLEVELAND, OHIO, will exhibit its well-known line of brushes, brooms, bellows, rammers, "Economy" wire wheel brushes, and general foundry supplies. Among the new items appearing in this exhibit will be the Osborn rockover drop draft moulding machine, this being the machine invented by Henry M. Molder, manager and superintendent of the Best Foundry Co., Bedford, Ohio. We will also show the "Sivquick," ordinary foundry riddle, which is made of an entirely new design, the wire cloth being formed into a basket with flaring sides, which more than doubles the sifting surface of the riddle. It is a recently patented article, and placed on the market for the first time during the last 30 days. Booth 34 and 35.

ARCADE MFG. CO., FREEPORT, ILL., will exhibit the latest models of No. 1 and No. 2 Modern Molding Machines. These will be equipped with pneumatic vibrators and automatic trip adjustments. They will have a number of new features of great interest. There will also be a demonstration of Buck's Roll-Up Device, which is achieving wonderful results in stove foundries. Perhaps the most sensational feature will be the exhibit of the Norcross jolting machine which is designed to ram molds weighing up to 20,000 lbs. They will exhibit also a large number of castings that are being made by prominent manufacturers in the U. S. and Canada. Booths 30-33.

FALLS RIVET AND MACHINE CO., CUYAHOGA FALLS, OHIO, will exhibit the following list:—1 Wadsworth combined sand mixer, compound and riddle; 1 No. 1, No. 2 and No. 3. Wadsworth improved core making machine (in operation); 1 Wadsworth core oven (baking cores); 1 Wadsworth core cutting off and coning machine; 1 Gagger mold with sample gaggers. Samples of various sizes and shape cores. Cabinets with the Wadsworth standard core prints. This is a working exhibit and will be run by electric motor, and will be in booth 119-122, first floor of the Exhibition Hall.

W. W. SLY MANUFACTURING CO., CLEVELAND, OHIO, will exhibit a model cinder mill machine. The balance of exhibit will consist of photographs, literature, etc. Booth 89.

DETROIT TESTING LABORATORY, DETROIT MICH., will have booth No. 116 on the second

floor of the convention hall, where they will receive their friends and customers.

CANADIAN MACHINERY, TORONTO, CANADA, will occupy booth 123 where they will be pleased to meet all their old friends and many new ones. H. V. Tyrrell and W. E. D. Wilkes will be in attendance.

WHITING FOUNDRY EQUIPMENT CO., HARVEY, ILL., will exhibit at booth No. 77-81, the following articles :—Tumblers, hoisting machine, standard ladles, shank, turnable. They also intend to have photograph stand showing their latest cranes and equipment.

CARBORUNDUM CO., NIAGARA FALLS, N. Y., will exhibit corborundum wheels. All grits and grades of wheels will be shown and the following representatives of the Carborundum Co., will be on hand, George R. Rayner, W. W. Sanderson, H. A. Eaton and R. B. Fuller. Booth 38.

HILL & GRIFFITH CO., CINCINNATI, OHIO, will exhibit a number of articles in the foundry supply and equipment line, among which are mentioned the following : A full line of peerless perforated chaplets, upon which we have patents and of which we are sole manufacturers. The Linn steel coated taper flask, molders' flat black shovels, patent portable core oven, sand sifters, full line of smooth-on cements and specialties, crucibles, foundry brushes, bellows, riddles, etc. Booths 72, 73 and 74.

OSCAR BARNETT FOUNDRY CO., NEWARK, N. J., will exhibit iron flasks of various types and sizes for all foundry purposes.

DIAMOND CLAMP AND FLASK COMPANY, RICHMOND, IND., will exhibit an automatic core machine for making all kinds of special cores, such as fitting cores, valves, T's, etc., a plunger type core machine for making stock and irregular shaped cores, a screw type core machine for mRaking stock and irregular shaped cores ; a core cutter for cutting standard cores, a core coner for coning standard cores, the diamond snap flask and slip jacket, asbestos core plates, adjustable flask clamps, patternmaker's bench trimmer, patternmaker's two jawed lathe chuck, dowel pins, etc. Booth 104.

BROWN SPECIALTY-MACHINERY CO., CHICAGO, Ill., will exhibit the hammer core machine, also cabinets for same and core tapering machine, machine in operation, making round, square and irregular shaped cores. Booth 101.

KROESCHELL BROS. CO., CHICAGO, ILL., will consist of an exhibit of a complete instalation of the crucible furnace with both oil and gas used as fuel, all in working condition. This equipment will consist of a stationary crucible furnace, oil pumping and blower system, and tilting crucible furnace. Mr. Schwartz, the inventor of the Kroeschell-Schwartz crucible furnace, and W. L. Kroeschell will be in attendance. Booth, temporary building.

DETROIT FOUNDRY SUPPLY CO., DETROIT, MICH., will occupy booth 95 which is in the gallery near the band stand. This booth is for the use of foundrymen and their ladies as a resting place, from which they can get a good view to all parts of the hall.

FOUNDRY SPECIALTY CO., CINCINNATI, OHIO, will exhibit at the Foundrymen's Convention, their parting material, partine, and brass flux, fluxine. Booth 73.

JONATHAN BARTLEY CRUCIBLE CO., TRENTON, N. J., will exhibit all types of regular crucibles together with specials used in the Tilting Furnace. Their new catalogue of their manufactured goods will be distributed. This will contain "Hints on the use of crucibles," "Graphite and Mining in Ceylon," Jonathan Bartley and L. H. Lawton will be at the convention. Booth 84.

THE FOUNDRY, CLEVELAND, O., will occupy booths 78-80 at the convention.

HERMAN PNEUMATIC MACHINE CO., Pittsburg, Pa., will exhibit the following machines at the Cincinnati Convention : 1 60"x72" Herman jarring molding machine, to be used for ramming large molds. Weight of which will be over three ton ; 1 small machine, table place 24"x30" complete with turnover and pattern drawing device. We will also exhibit a novel ladle barrow, and roll over device for handling large molds. This roll over device can be applied to any flask. Booth, temporary building.

MONARCH ENGINEERING CO., BALTIMORE, MD., will exhibit a Steele-Harvey furnace, Monarch core oven, Monarch portable heaters, low pressure blowers, ladle heaters, stationary furnace, etc. H. D. Harvey and others of the company will be in attendance. Exhibit in the temporary building.

ROCKWELL FURNACE CO., 26 CORLANDT ST., NEW YORK, will make a complete exhibit of melting furnaces, including lift-out type of crucible furnace, tilting crucible and simplex and double melting furnaces. These furnaces including a ladle heater, will be operated with a fan blast of 12 ounces. There will also be shown a soft metal melting furnace and an annealing, hardening and tempering furnace ; compressed air and self-contained type of portable heaters for skin drying molds and other heating work. This exhibit will be to the right of the entrance going from the Music Hall to the temporary building.

OLIVER MACHINERY CO., GRAND RAPIDS, MICH., will have on display and under running demonstration the famous Wadkin Universal Woodworker. There will be made on the woodworker, any pattern on any core that the representatives desire.

J. D. SMITH FOUNDRY SUPPLY CO., CLEVELAND, will exhibit a working battery of three natural draft furnaces, a new style core oven, a Cleveland sprue cutter, a Cleveland molding machine, a Cleveland water tumbler, a wall crane serving the furnaces, etc. Booth, temporary building.

E. H. MUMFORD CO., PHILADELPHIA, will have a joint exhibit with Curtis & Co., Mfg. Co., St Louis, showing the Curtis-Mumford Overhead Molder, which is a suspended mechanism by which large flasks jolt-rammed on an arcade jolt-ramming machine will be lifted and rolled by power and the pattern drawn from the joint while the mold is suspended. They will also have a new 10" high trunion power squeezer, and a standard power ramming split pattern vibrator machine on exhibition.

The above list is very incomplete but it will serve to show what may be expected at the convention. Other exhibitors will include Oscar Barnett Foundry Co., booth 117, Berkshire Mfg. Co., 8-9, S. Birkenstein & Sons, 21, A. Buch's, Sons Co., 60-67, Geo. F. Crivel & Co., 96, Curtis & Co., Mfg. Co., 56-58, Detroit Foundry Supply Co., 95, Dixon Crucible Co., 75, Hickman-Williams Co., 82, E. Killings Molding Machine Works, 57-59, Walter Macleod & Co., 52-54, E. H. Mumford Co., 56-58, J. W. Paxton & Co., 88, Pickards-Brown Co., 83, H. E. Pridmore, 25-27, Robeson Process Co., 68-71, Sterling Wheelbarrow Co., 118, Tabor Mfg. Co., 36-38, and Calumet Engineering Co.

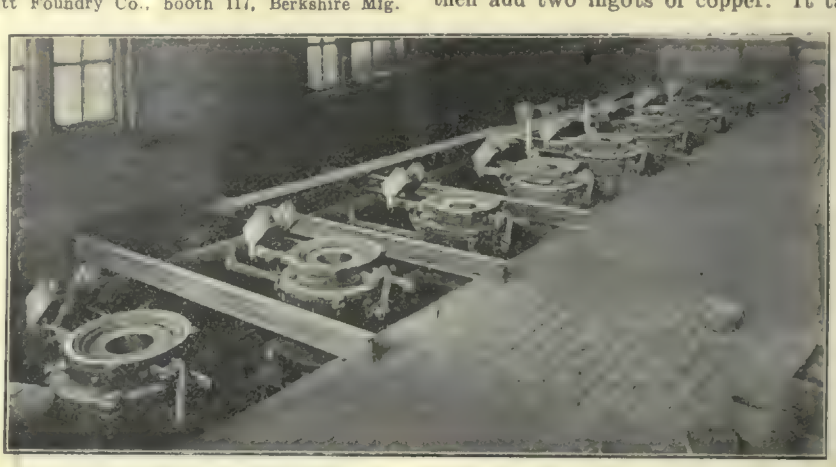
The secretary of the Foundry and Manufacturers Supply Association is now at convention headquarters. His address is O. E. Hoyt, Hotel Sinton, Cincinnati.

FISHER CRUCIBLE FUEL OIL METAL MELTING FURNACE.

The inventor, Mr. Alfred Fisher, of Lewiston, Maine, first entered into the foundry of Henry Lowell, of Manchester, N.H., Oct. 16. 1880, 26 years ago. After serving his time of four years as a molder, he spent two years following at Amoskeag Foundry, the same city, working on machinery castings. He then went west to Chicago where his experience was broadened by entering the plant of the McCormick Harvester Co., at which place the first experiments were then being made by them with crude oil as a fuel for forging.

This demonstrated to his satisfaction that the same could be used to good advantage in carrying on experiments with his brass melting furnace, using a crucible. Then came three years' trouble perfecting a cover which would protect the operator from the intense heat while in operation and which would serve as a feeder for crucible as well. In order to make a still greater saving of time and fuel and permit the metal to be brought up to its proper heat quickly, a second cover was then found necessary. A drop bottom was then added in case the furnace clogged up with a very heavy slag, which could be removed with ease by operator. These are the features of the Fisher furnace.

In a great many large foundries there is shown a neglect in not properly instructing the melters. After filling the crucible with yellow brass borings, they then add two ingots of copper. It takes 1,900 degrees of heat to melt copper and only 1,400 for yellow brass. In alloying these metals, copper should melt first, adding the borings gradually.



Part of a Battery of Twelve Fisher Furnaces being Installed in the Plant of the Clayton & Lamber Manufacturing Co., Detroit.

One great advantage in using an oil fuel furnace is that it is always ready for use. An oil fuel furnace is ready in two minutes, thus averaging the required temperature nine hours out of every ten. The operating cost of this furnace is 6½ cents per 100, figuring crude oil at 4 cents per gallon, melting any kind of metal you wish from copper to scrap sheet zinc.

The accompanying illustration shows a part of a battery of twelve Fisher furnaces, being installed in the plant of the Clayton & Lambert Mfg. Co., Detroit, Mich.

Mr. Fisher makes a rather unique proposition, demonstrating his confidence in his furnace by offering to instal in the plant of any Canadian foundry, a furnace on trial with no obligations whatever on the part of the party accepting his offer.

These furnaces are manufactured by Alfred Fisher, 103 West Munroe St., Chicago.

Arranging Molds in Groups to Lessen Cost of Production

Some Foundrymen Encounter Difficulties in Production which may be Overcome by Multiple Core Molds which are Described in this Article.

By H. J. McCASLIN

To satisfy delivery and meet present day prices steel foundrymen encounter many trying and exacting problems in the production of certain castings.

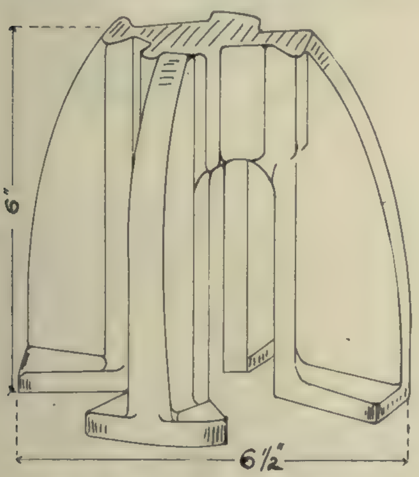


Fig. 1.—Mold with Similar Parts.

These conditions may be due to the lack of equipment or the number of castings not warranting the fitting up of a machine, or perhaps as often is the case a dry sand mold is preferable.

It might be further stated that pouring small individual molds from a bottom or stopper pouring ladle, or rehandling the metal in a bull ladle is not always profitable. This may be more truly said in the pouring of snap flask molds by the former method, which, owing to the pressure of the metal entering the mold, they require special arranging and backing up.

One of the many ways devised and employed to accomplish the desired result, is the multiple or group method of arranging core molds.

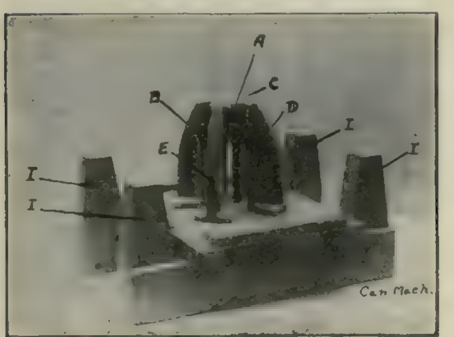


Fig. 2.—Assembled Pattern.

As the name implies, the metal or formation of molds consists of the stacking or grouping together a series of cores containing impressions of the object to be cast. The gates are so arranged that the series of molds thus formed are poured from the same runner.

In the production of similar objects to that shown in Fig. 1, which must be removed from the sand in sections, the core mold has a decided advantage. This is particularly due to the adhesiveness of core sand and the accessible form of a core before or subsequently to the removal of the frame or box.

Discussing the molding of the object here illustrated, Fig. 2 shows the assembled pattern upon the bottom board and illustrates the arrangement and position of the five pattern parts, A, B, C, D, E, shown in Fig. 3. Also shown in the illustration is a conical core print, F, which is attached above part A, as shown in a partially assembled view of core box, Fig. 4.

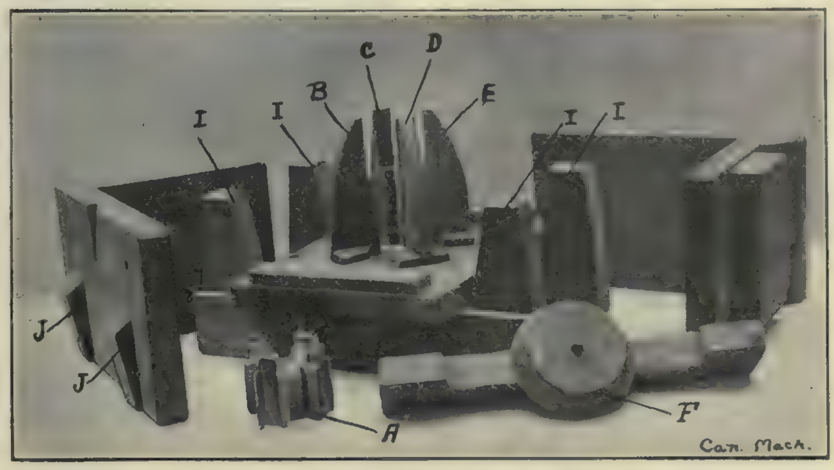


Fig. 3.—Fine Pattern Parts.

The object of the core print F above part A is to form an opening through which part A may be removed from the sand. The depression formed by this conical print is subsequently closed in setting the cores by a corresponding projection of sand formed by the depressions in the molding block H, Fig. 5.

The form of the object to be cast will, of course, determine the formation of the cores for pouring. In this case take a rectangular form consisting of eight molds, grouped together within a depression formed by molding up the block H, Fig. 5, in the same manner as that of a pattern. Note the manner of gating, the individual molds form a runner core at the centre of group.

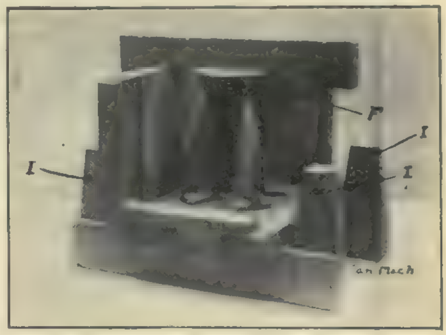


Fig. 4.—Partially Assembled Corebox.

The runner core is made from the same box as that of the molds, by simply substituting a runner pin in place of the pattern. Figs. 3 and 4 are also illustrative of a very handy and convenient core box clamp, the utility of which will be

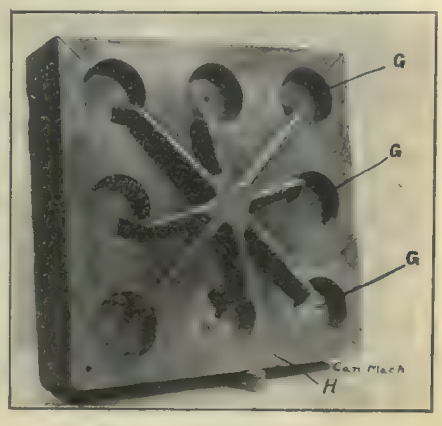


Fig. 5.—Molding Block.

readily appreciated. The assembling of a box equipped in this manner requires no more effort on the part of the core-

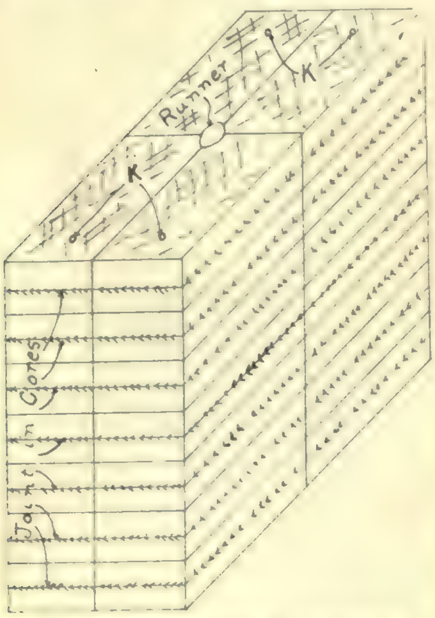


Fig. 6.—Combined Grouping Formation.

maker than that of a plain box, and it eliminates the use of dogs or clamps, say nothing of their destructive tendency.

The arrangement of the clamp simply consists of attaching to the protruding ends of the bottom board cleats, wedge shape uprights, as shown at I, and to the sides of the box opposite these uprignts corresponding wedge shape pieces, J. The assembling of the box upon bottom board bringing these wedge shape surfaces together forming a positive clamp. A diagramatical outline of a combined grouping and stacking formation is shown in Fig. 6.

This arrangement readily applies itself to rectangular cores, the runner be-

Fig. 7.—Six Large Ring Castings.

ing formed at their intersecting corners as shown. In this instance the core is made in halves and dried, being pasted together if desired, but which is not always essential. With the two opposite cores of each series inverted in order to form the runner, the cores are stacked up to about four feet high.

Provision for pouring may be made by clamping the cores together or placing them within a curbing and backing them in with sand. To allow for the escape of the air or gas caused by the inflow of metal, a good vent must be provided. This may be carried up through or from core to core as shown at K.

In the production of large diameter rings the segmental construction of multiple molds is resorted to with very good

Fig. 8.—Cores Ready to be Assembled.

results. This may be particularly said when it is desired that they be cast from the same heat, as it would not take many ten or twelve-foot diameter molds to place floor space at a decided premium, if you should be fortunate enough to have any number of such size flasks at your disposal. At a glance one would be inclined to think the cost of

Fig. 9.— Corebox.

production would be greater than if molded upon the floor with pattern in the ordinary way, which, however, is not the case. The hours of labor required in making and setting the cores, and the cost of material used will show a very good margin.

Fig. 7 shows six large ring castings intact as they were delivered from the foundry to be separated and cleaned.

With the exception of the top and bottom ring of cores, all adjacent rings contain a half impression of ring upon each side. It will be readily understood that in the stacking of the cores these half impressions come opposite, forming a complete section of ring.

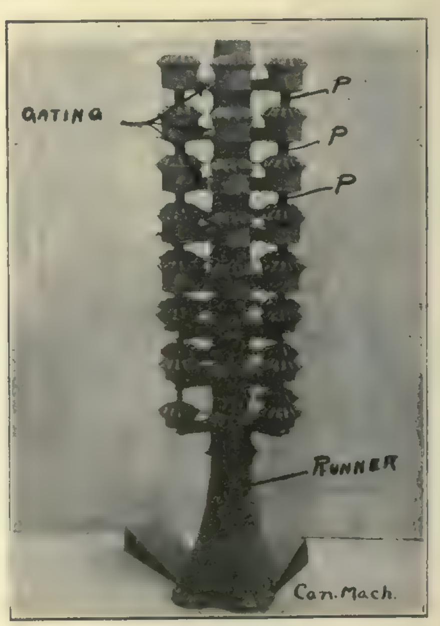


Fig. 10.—32 Bevel Gears.

Fig. 8 shows a number of cores upon the floor ready to be assembled within the pit. The forming of the four risers I, Fig. 7,, about the inner diameter is done during the packing in of sand, holes being provided, as shown at M, Fig. 8,

in each series of cores at the desired intervals at which points the runner blocks are rammed up. Upon one of the riser openings, the runner core is placed, the metal entering the mold in this way.

Fig. 9 illustrates the core box from which the cores are made. As the upper and lower surface of this core contain a part impression of the ring to be cast, the box, of course, is made accordingly. This necessitates bedding in at the top of the box a pattern or form as shown at N. Owing to the rough usage to which this part is subject, it is made of metal of about one quarter-inch thickness.

To locate or guide it into its correct position while being rammed and bedded, in the ends of the box are cut out, as shown at O, to coincide with the contour of form. If accuracy has been maintained in laying out the radial ends of the core box and about 3 -64 of an inch allowed at each end of the box for the swelling of core, they should form a complete circle when setting. That the setting of each tier of cores may be tried for accuracy during their assembling and stacking, a gage board is attached to and revolved about a spindle similar to a sweeping operation.

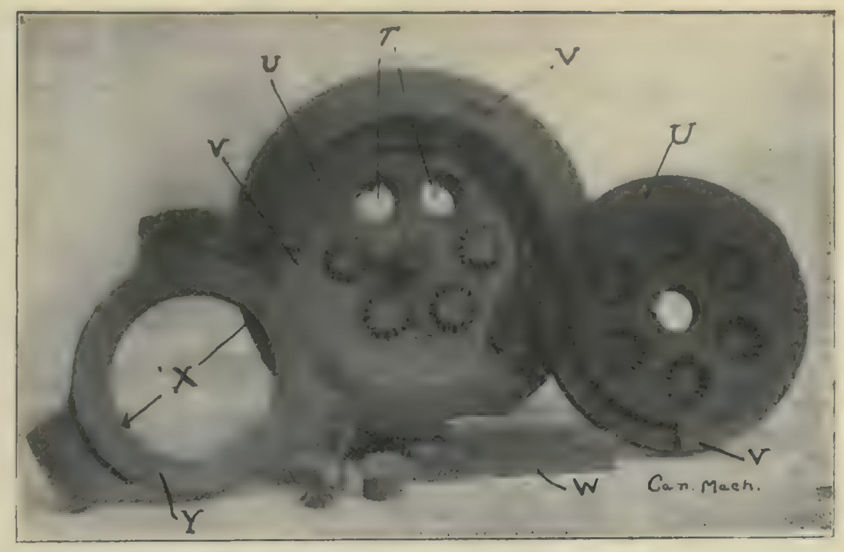


Fig. 12.—Molding Bevel Gears.

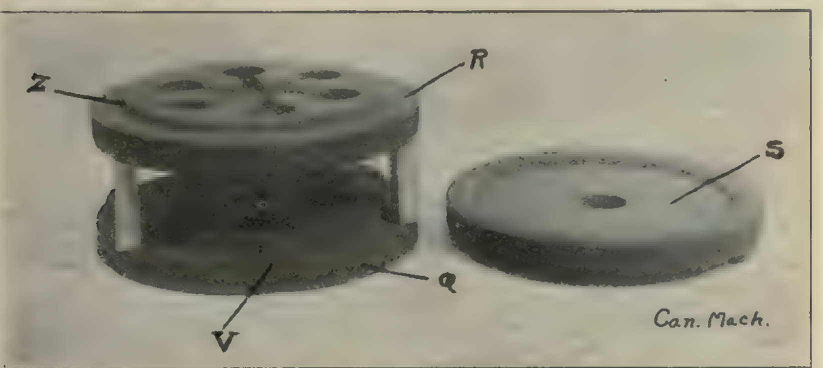


Fig. 11.—Box Construction.

Especially adaptable to this method of molding is small level gears, as shown in Fig. 12. The gears herewith shown were not intended for patterns, but are steel cut gears taken from stock, and wood plugs inserted in the bores. Owing to the number used and the expensive method of production it was decided to cast them of steel, which was satisfactorily accomplished, as shown in Fig. 10. This illustration shows a group of 32 intact castings as they came from the foundry. For convenience in plotographing they are shown in the reverse position to that of casting.

Connecting the gears at their centre can be seen the tie bars, P, formed by the vent channel between the adjacent molds for carrying off the air and gases.

Before discussing the arrangement of the two core boxes from which the cores are made, note the form and manner in which the cores Q R are set together, Fig. 11 will give a good idea as to the box construction. Blocking the two cores apart in this manner is simply done for the sake of clearness, and to give a good idea how they drop upon one another.

Core Q, within which the face of the gears are formed, is made from the box shown in Fig. 12 and 13. Fig. 12 illustrates the disarranged box, showing how openings, T, are cut out to receive the six gears. It also illustrates the manner of forming the offset joint, U, and the marker V, upon cores, that they may match up correctly during their assembling. The strike W is employed in striking out the surplus sand from the opening X in the top frame Y. This frame forms a corresponding offset to that shown at Z, Fig. 11, or a surface to receive core R.

Shown at the centre of box is the runner A. For forming core R, as shown in Fig. 11, which contains the hub of gears and also the gating, the core box shown in Fig. 14 and 15 is employed.

Fig.13.—Corebox.

While very similar to the box used in forming core Q, a few remarks may not

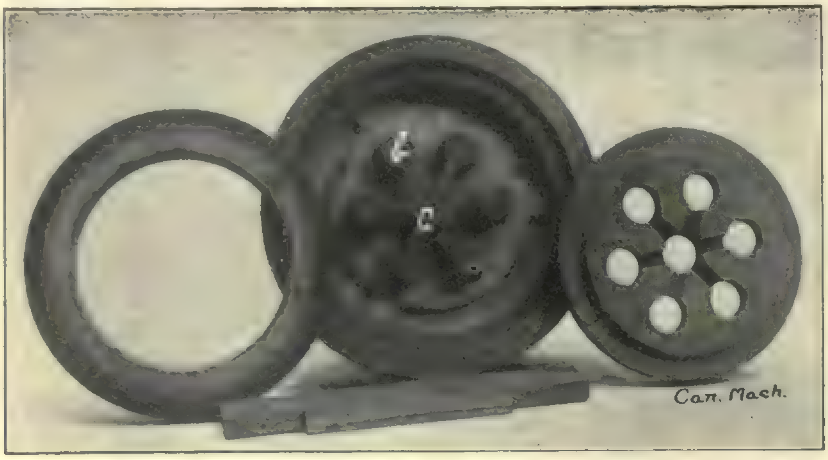


Fig. 14.—Corebox.

be amiss. The six hubs, b, are turned up and secured in place with a centre dowel, as also is the runner and gating c. The depressions thus formed within this core are more clearly shown to the right of the box. Fig. 14, which shows very plainly the manner of gating into the hubs.

Core 5, Fig. 11, one of which is used at the top of the series of cores for closing up the uppermost mold, is made from the box shown in Fig. 12 and 13 by simply filling up and slicking off the impression of face of gears.

In preparing the molds for casting, the cores are stacked and backed in with sand within a series of suitable flasks, and poured in this manner.

NEW ENTERPRISE FOUNDRY

The Enterprise Foundry Co., Sackville, N.B., have opened their new stove works which replaces the plant that was completely destroyed by fire, July, 1908. This company was established in 1887. and has shared in Canada's industrial development.

The fire came at the worst possible time, in view of the fact that the company had an immense stock of stoves, ranges and furnaces made up in preparation for fall trade; and most discouraging of all, their carefully-selected and costly stove patterns were included in the ruin.

Less than two months after the fire, the Enterprise Foundry Co. started rebuilding on the old site, the magnitude of which may be gained from the fact that over 1,000 tons of stone and 553,000 bricks were used in its construction, and that it covers an acre and a half, leaving about the same amount of land for further extension.

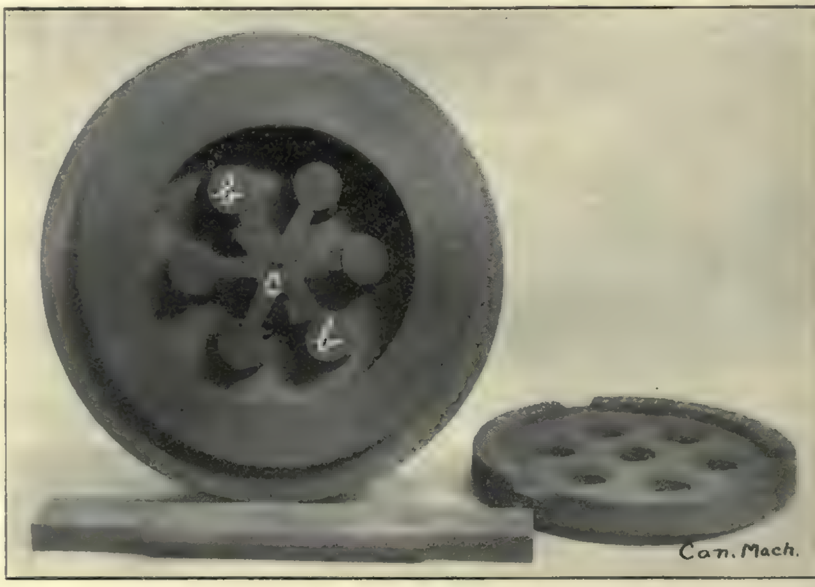


Fig. 15.—Corebox.

Fig. 1.—Interior View of the Enterprise Foundry

Plans for the new buildings were prepared by H. H. Mott, architect, and building operations were begun on September 10. The work of construction was carried on by J. E. Lusby, Amherst, contractor.

The Buildings.

The buildings, which are ranged in the form of a hollow square, as shown in the view given, are of brick and all one storey with the exception of the warehouse. The floors throughout are of concrete, covered in some cases with wood to facilitate working upon them. Substantial fire walls extend through the roof, separating the different departments, so that in the event of a fire occurring in any one building, it can be prevented from spreading to any of the others, the heavy tin-lined doors shutting off all communication.

The power-house is in the centre of the big square, apart from the other buildings. A Robb-Mumford return tubular boiler, built by the Robb Engineering Co. has been installed. The engine is a Corliss type of 150 h.p., manufactured by Goldie & McCulloch Galt.

Adjoining the power-house is the carpenter and pattern shop, separated from it by a fire wall. It is equipped with the necessary saws, surfaces, etc., for pattern work. Since the fire a large staff of pattern-makers have been preparing patterns for the lines of stoves manufactured by the Enterprise foundry.

Fig. 2.—Enterprise Foundry —Erecting Department.

Molding Shop.

The molding shop is 200x65 feet, and is fitted with the most modern devices procurable to lighten labor. Although adjoining the moulding shop, the cupola house is in reality entirely separated. It is 40x20 feet, and is connected with the yard by an inclined railway, through which are drawn the supplies of coal and iron. The cupola's melting capacity is seven tons of iron an hour, and frequent tests of the melt are made by analysis to ensure the castings turned out being smooth and tough.

Fig. 1 is a view of the foundry and gives an idea of its size. As the cupola is in a separate building, as explained above, it is not shown in the photograph

Enterprise Foundry—Finishing Room.

The cupola is 40 ft. high and 6 ft. diameter. Surrounding the cupola is the stage or charging floor which is constructed of reinforced concrete.

This is one battery of six mills running from 24-in. round to 48-in. square and another similar battery is being installed. A Sturtevant blower, connected to each mill by galvanized piping draws off all dust and keeps the mill room perfectly clear.

Finishing Department.

When the castings are taken from the mills, all defective pieces are rejected and the perfect ones are then ground off and are ready for mounting. In the mounting and finishing shops, which are 150x70 feet, the process of making the complete and perfect stove is further advanced, each piece being carefully fitted and bolted into its proper place. In this department also is the machinery for constructing Enterprise Monarch Steel Ranges. The steel sheets are cut, bent, punched and rivetted all by heavy machines, no heat being used at any stage of the process. The necessary copper and tin-work are also carried on here, each part being examined to see that it is perfect in workmanship, fit and finish, before continuing in its forward course.

Next in the chain of buildings comes the plating room, 50x50 feet, where the platers take the plain black castings in hand; and after many immersions in the different tanks and baths, produce brilliant plated work.

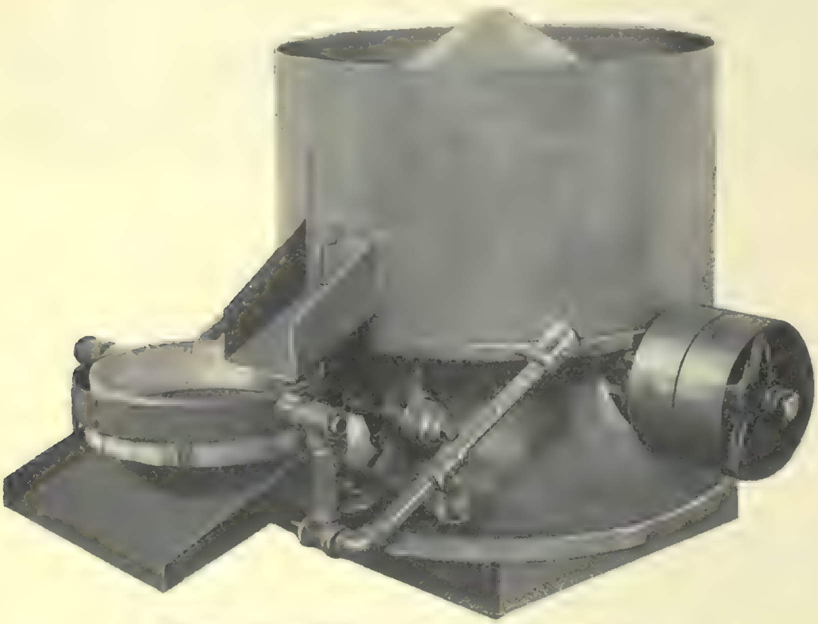
Then comes the final process of cleaning and crating, which is done in a building 50x25 feet, before removal to the warehouse where the completed stoves are stored until required for shipment. The warehouses are two-storey, to give greater capacity for storage, and the various entrances open out on a siding of the railway which runs into the works; so that the raw materials are deposited and the finished product loaded directly on cars for shipment.

The officers of the Enterprise Co. are: W. S. Fisher, president; R. B. Emerson, vice-president; F. A. Fisher, manager; and A. E. Jubien, secretary.

WADSWORTH SAND-MIXING MACHINE.

The machine shown in the accompanying illustration consists of an ordinary roller mill in which two rollers weighing several hundred pounds each, travel around in a circular path upon the cast iron base plate, the rollers being driven from the driving pulley shown on the right, by means of a vertical shaft and a set of bevel gears.

In the centre of the casing surrounding the machine there will be seen a metal cone which serves two purposes; first, it protects the upper bearing of the shaft carrying the roller driving mechanism, in fact, the cone is attached to this mechanism and revolves with it; second, it serves to distribute the sand when it is shoveled or dumped into the machine, so that it will fall where it will be immediately acted upon by the rolls.



Wadsworth Sand Grinding and Compounding Mill

Between the rolls are two scrapers which throw the material from the edges of the pan under the rollers. A batch of material is introduced into the machine while it is in motion and ground with the addition of the necessary binding material. Where flour is used it is mixed with the sand when the material is first introduced into the machine. If core oil is to be used, this is added next, and lastly, the proper amount of water.

Mr. Wadsworth has always recognized two classes of binders, particularly in the case of core sands for core machine work. For holding the sand together previous to baking, he has recommended a binder having a sticky nature like flour. For holding the sand together after baking, he recommends the use of core oil, linseed oil glutrin or some other liquid compound. His standard mixture was formerly composed of 12 quarts of sand, one-half pint of boiled linseed oil and two quarts of flour. Later he substituted silica dust for the flour.

When using the machine he has found it possible to cut the silica dust or flour in half, using only one quart of this in the mixture, but has not found it possible to cut down the oil binder. Of course, this mixture is made entirely of new sand.

Several other points in connection with the machine which are worthy of note are as follows: After the charge has been mixed, the gate shown in the front of the machine is opened, when the scrapers and rollers force the charge through the inclined spout into the riddle. This riddle is only operated while the machine is discharging, the mechanism being held out of contact with the cam at other times by means of a clamp controlled by a small wheel conveniently located.

This machine gives Mr. Wadsworth a complete line of core room equipment, the same being now manufactured by the Falls Rivet & Machine Co., Cuyahoga Falls, Ohio.

METAL MARKETS.

The aggregate volume of business done during the month has been very good. Trade fell off around Easter, but picked up afterwards splendidly. All metals with the exception of copper have moved well and copper has not done so badly, considering that it has suffered from uncertain conditions in New York.

Despite a shading in copper for large quotations, ordinary jobbing lots are still at 14c. The primary markets all the way through have not been in the best of shape, and local quotations have received no help from them. Tin has advanced during the month owing to stronger figures in the primary markets, and good home trading, and quotations for jobbing lots are now round 32½c. Inquiries are good, and plenty of new business is near at hand. Speculation in the English market has been very quiet somewhat unusual for tin. Spelter has been remarkably firm all through the month, and jobbing prices advanced 25c making quotations $5.75. Business is good with stocks on the light side. Lead advanced 10c during the month, and is now quoted at $3.75, and Trail at $3.65. Business is good, but the market is not so strong as it might be owing to sagging in the English market.

There was a fair demand during the month for pig iron, although consumers were compelled to pay somewhat higher prices than they did a few weeks ago. The Eastern furnaces being in receipt of good orders for steel practically withdrew from the pig iron market during the month—the result being a stiffening in the prices of other furnaces. Heavy consignments of imported iron are expected during May, in fact much heavier tonnage than for the same month last year. Open-water prices are now being quoted for imported pig.

Iron and steel conditions are much brighter in the Old Country. Exportations have improved as well as the home consumption. While pig iron in the States is dull, there has been a decided improvement in finished steel orders. Prices are far from being uniform, but they are being held better than at any other time since the open market was declared.—J. F. A.

Matthem Morton, founder and president of the Morton Mfg. Co., Muskegon Heights, Mich., died at his home in that city on March 10, from pneumonia. Mr. Morton was a native of Scotland and was born in Ayrshire, May 5, 1836. He invented a great number of machines and developed and perfected the machines built by the Morton Mfg. Co., The last years of his life were devoted to the perfection of a special railroad draw-cut shaper for slotting axle boxes, planing axle box brasses, shoes and wedges, rod brasses, and a great variety of other work. This machine is already recognized as the most efficient equipment for the work that has been offered and one is installed in the Stratford shops described in the April issue.

INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News.

Machine Shop and Foundry.

Clatworthy & Co. will erect an $8,000 machine shop at Toronto.

W. C. Belina is opening a machine shop at Cartwright, Man.

The Otis-Fensom Elevator Works will enlarge their plant at Hamilton.

The Whitman & Barnes Mfg. Co., St. Catharines, is erecting a forge shop.

T. E. Reeb has purchased the foundry and repair shop of A.H.B. Neff, at Welland.

The Hamilton Bridge Co., Hamilton, will shortly start work upon several additions to their plant.

The Joseph Bowman structural steel concern may locate in Sherbrooke if that city grants certain concessions.

A permit has been taken out for a $5,000 brick addition to the Canada Steel Goods Company's factory at Hamilton.

Brock & Flaws, Cookshire, Que., have disposed of their iron working machinery and buildings to Sargeant Brothers.

The Capital Scale, Brass & Iron Foundry Co., Ottawa, Ont., have purchased a site for the erection of a new factory.

A. C. Rioux, for some years with the Massey Harris Co., has located in Claresholm and will open an up-to-date machine shop there.

A machine and repair shop is to be established in Selkirk, Man., this spring. The promoters are C. Cornish and W. Overton, of Selkirk.

The Courtwright Stove Co. is the name of a new stove and furnace manufacturing concern which proposes to locate at Courtright, Ont.

It is stated that Seattle capitalists are contemplating the establishment at Vancouver of a large manufacturing plant for locomotives and logging engines.

The Victoria Machinery Depot, Victoria, are enlarging the marine works damaged by fire some time ago. New boiler shops are being erected and an up-to-date plant installed.

The announcement that the American Can Company has acquired the Norton Can Company, Hamilton, has been confirmed by the heads of the latter company. Large additions to the plant are contemplated.

The Russell Harvesting Machine Co., have issued a prospectus of the Canadian factory to be situated at Woodstock. They will manufacture the Russell shocker which will fit any binder. It was invented by J. Russell, Hamilton, the head of the company.

The American Steel Range Corporation of Norfolk, Va., with a capital of $300,000, intend to commence manufacturing in Canada and establish a plant at Welland if arrangements can be made. The Canadian factory will be called the Stanford Steel Range Co.

James Maclean & Sons, Bryson, Pontiac County, Que., intend starting a machine shop at Bryson for the manufacture of oil engines, pumps, sawmill machinery, etc. They will require a number of machine tools but have not placed orders for them yet.

The Hamilton Nail and Wire Co., Hamilton, has purchased four acres of land at New Westminster, and will operate a large factory as soon as it is possible to do so. Raw material can be readily brought by the big liners which come to this coast regularly.

The Doty Engine Work Company at Goderich is preparing to erect several new buildings this season. The company has already commenced work on a new blacksmith shop and a new erecting shop is to follow, and after these are completed it is intended to proceed with the boiler shop.

It is understood that Jas. A. Moore, of the Moore Iron Works, Port Townsend, Wash., is negotiating for a site at Vancouver on which to locate immense iron works and possibly a steel plant. The investment planned contemplates an initial expenditure of at least $500,000.

TheDominion Government has accepted the tender of Haney, Quinlan & Robertson for the construction of the National Transcontinental terminal shops at St. Boniface. The amount of the tender, which was the lowest of those submitted, figures out to a total of about $869,000.

New Glasgow, N.S., is to have a new industry called the Harris Forge Co., capitalized at $25,000. Modern forge shop machinery will be immediately installed, to manufacture shape and drop forgings, for which there is a great demand, and practically no competition. The drop forging industry is an entirely new one in the Maritime Provinces.

One of the new industrial concerns that will open up in Montreal this spring is a shovel and sheet iron factory. Geo. Woolfe, of Glasgow, is making final arrangements to this end, and expects to have the necessary plant shipped from Scotland early in May. It will be a branch of the Glasgow factory, which is one of the oldest in its line in that city.

The new Burrill-Johnson Iron Company's buildings at Yarmouth, will be of brick and they will be equipped with the most modern machinery. Providing that the company secures certain concessions from the town they will engage in steel shipbuilding on an extensive scale. The company ask to have their rate of assessment fixed at a sum not more than $20,000, free water, and a free site for their shipbuilding plant.

The Smith's Falls Malleable Castings Co. opened their new foundry on April 12. The old one is working to its capacity and cannot conveniently handle the present business. This foundry was acquired about two years ago, but owing to the slump of 1907 was closed. It is now found necessary to open it and the two will be run to their capacity, giving employment to about 150 more hands.

Business promises to continue to keep booming at the plant of the Dominion Iron and Steel Co., at Sydney. This concern has been most successful in securing orders to keep the plant in operation. The Grand Trunk Pacific has just awarded the company a contract for one hundred miles of rails, and there is a possibility of securing another order for an additional one hundred miles for the same railway.

Municipal Enterprises.

Cobalt is to have a waterworks system.

A $1,250 sewer will be constructed on Dundas Street, Woodstock.

$20,000 will be spent for waterworks extensions at Fort Frances, Ont.

Hull, P.Q., will install new pumps in its waterworks plant, at a cost of $40,000.

Medicine Hat Council have decided to ask the ratepayers to vote $55,000 for sewer purposes.

The Goderich Council has decided to submit a by-law to the ratepayers to issue $20,000 waterworks debentures.

The Edmonton city council has passed a bylaw authorizing the expenditure of $40,000 for sewer improvements.

The Alberni Waterworks Company has been incorporated to supply water for domestic uses to the town of Alberni, B.C.

The ratepayers of Claresholm, Alta., will be asked to vote a sum of $70,000 for a waterworks system and electric light plant.

At a recent meeting the Glace Bay, N.S., water committee recommended that $7,000 be borrowed for repairs to the town reservoir.

The Godson Contracting Co., Toronto, has the contract for constructing the first section (6,386 feet) of that city's trunk sewer, at $138,528.

Montreal's new waterworks system is expected to be completed in three months' time. Another million dollars will be raised to finish the work.

TheYorkton, Sask., council have adopted the report of the water and sewerage committee in favor of extending the system at an estimated cost of $50,000.

The Elk Creek Waterworks Co. are planning extensive improvements, including the laying of duplicate mains and the construction of a large reservoir at Chilliwack, B.C.

At a meeting of the executive committee of the Northwest Winnipeg Ratepayers Association, it was decided to ask for the immediate construction of water mains on Selkirk, Pritchard, Manitoba and Magnus streets.

It is estimated that $53,840 will be required by the Hamilton Waterworks Department for improvements, which include $25,975 for the beach pumphouse, $67,000 will be required for water works construction, this amount including $35,000 for extension of mains and $20,000 for new services.

The following contracts have been awarded for waterworks supplies for 1909 at Ottawa: Hydrants and valves, Thomas Lawson & Sons, Ottawa, $2,644; cast iron pipe, T. Sidney Kirby & Co., $15,065.10; lead pipe, McKinley & Northwood, $1,306.77; brass goods, James Robertson, Montreal, $987.95.

The Winnipeg civic board of works have granted the request of the National Transcontinental Railway for permission to lay a sewer emptying into the Red River. The length of the outlet is about 400 yards and it will cost $20,000. The cost of the sewer, five miles in length, which will be laid by the commission to the shops at Transcona, will be about $170,000.

Railway Construction.

The Nipissing Central Ry. will build and run an electric line in Haileybury.

An extension of the electric line at St. Thomas will be made to Aylmer.

The Montreal Street Railway contemplates making several extensions to its lines.

The Toronto Railway Co. will lay heavier rails on some of its routes this season.

The Blind River Colonization Ry. plans to build from Blind River, Ont., north to a junction with the G.T.P.

The C.P.R. are negotiating for St. John property upon which to construct yards and terminal facilities at a cost of $25,000.

The Simcoe Electric Railway Power Company are applying for incorporation to construct an electric railway from Midland to Coldwater, Ont.

The Hamilton Street Railway Company has made formal application for permission to start the work of laying the new tracks on James Street, that city.

The C.P.R. will double track their line between Smith's Falls and Peterboro, a distance of 133 miles, and carry out the construction of the direct grain route about 76 miles in length.

Extensive improvements will be made this summer to the Duluth extension of the C.N.R. Among other changes to be made, the track will be re-tied and ballasted and put in good shape generally. The bridges will also be repaired.

Important extensions to the northern and southern ends of the Chatham, Wallaceburg, and Lake Erie electric road are announced. The towns of Blenheim and Ridgetown on the south and Petrolea and Sarnia on the north will be tapped this summer.

Cobourg town council has granted the request of the Provincial Steel Company to construct a line of railway from its plant to the lake front. The Cobourg, Port Hope and Havelock Electric Railway Companies have also been granted franchises to enter that town.

The Cobalt Range Railway Co.'s bill was reported by the Commons Railway Committee. The company is authorized to construct the following lines: From Haileybury to Elk Lake via Bucke, Firstbrook, Barr or Hudson, Lundy, Auld, Cane or Henwood Barber, Tudhope or Bryce and James, thence to Gow Ganda Lake. From Ville Marie, Que., to Opasilica Lake, and thence to the N.T.R.

Electrical Notes.

The London Electric is quite willing to sell its plant to the city by arbitration as a going concern for $506,000.

The B. C. Electric Railway Company will establish a generating plant at Jordan River, forty or fifty miles from Victoria.

Acting on the advice of C. Mitchell, civil engineer of Toronto, the Prince Albert Council will proceed with the development of a million-dollar hydro-electric plant on the Saskatchewan River.

The boiler house, air compressor building, electric light plant and hoist house, together with all the machinery, with the exception of two dynamos, at Bruce Mines, Ont., have been destroyed by fire.

The North Regina Rural Telephone Company, of Regina, has been incorporated.

Calgary ratepayers have carried a by-law to raise $144,000 for the extension of the electric light.

The Beach Co., of Iroquois, Ont., have valuators out arranging to purchase a pole route for an electric power line from Iroquois to Brockville.

A by-law has been passed in Berlin, Ont., to issue $40,000 debentures for the Hydro-Electric power scheme, also to issue $8,000 debentures for the extension of gas mains.

The Govan, Sask., Rural Telephone Co., has been organized and will apply for incorporation at once. It is the intention of the company to put up about 60 miles of line this summer.

The Northern Electric and Mfg. Co., have been awarded the contract for supplying and installing a Western electric alternator, exciter, and switchboard equipment for the town of Iberville, Que.

The Canada Automatic Machine Telephone Co. will be operating in Brantford, by May 1, according to the announcement of General Manager Mackay. The rates will be $25 for business and $15 per year for residential telephones.

Good progress is being made upon the construction of the new intake at the Edmonton power house. Two of the five lengths of pipe have already been placed in position, and the work completed is the most difficult part, as the pipe is under about eight feet of water in the centre of the river.

The following by-laws have been passed by Edmonton ratepayers:—To raise $175,000 for electric light and power plant; $113,000 for water purposes; $13,000, fire equipment; $154,000, for improvements to municipal telephone system; $210,000 street railway extension; $47,000, for extensions to the electric light system.

At a meeting of the Brockville town council, Board of Trade, Trades and Labor Council, and Light and Water Commissioners, a resolution was passed that Mitchell Bros., consulting engineers, of Toronto, be requested to make a report relative to the cost of extensions, requirements and working economies of the light and water plant.

Wynn Meredith, who acted as consulting engineer for the British Columbia Electric Railway Co. at the time its plant on the North Arm of the Inlet was installed, is in Vancouver consulting with the management of the company regarding the extension of its plant and improvement at Lake Buntzen.

A new schedule of electric light rates has been submitted to the Sherbrooke ratepayers. The most important changes are the following: Consumers will be charged at the rate of 5c. per kilowatt instead of 10c., as heretofore. There will be no rent charged for meters, and to make up for this, each person will have to furnish his own globes.

Calgary city commissioners have awarded to the Northwest Electric Company, a local concern, the contract for the supply of copper wire for the street railway. Contract price, $17,339.60. Other contracts which have been awarded are: Meter generator, set and switchboard Chalmers-Bullock Co., $15,950; 750 h.p. engine, Robb Engineering Co., Amherst, N.S., $14,300; 1,100 tons of steel rails, Gorman, Clancy and Grindley, Calgary, $70,000.

The lease of "Kai-Kai-Ke" and the "Island Rapids" groups of water-powers will be offered for sale at public auction in the sales room of the Quebec Department of Lands and Forests on May 11. The "Kai-Kai-Ke" group is situated in the County of Pontiac and its power at low water is 32,980 horse-power. The "Island Rapids" group, whose power is 32,000 horse-power, is situated in the same county.

The B. C. Electric Railway Co. has decided to use aluminum in place of copper for transmission purposes on its Chilliwack line, and has let a contract for 390 miles to the Northern Aluminum Company, Montreal, for $45,000. This company is a Canadian branch of the Pittsburg Reduction Co. and has its works at Shawinigan, Quebec. This is the first time that aluminum will have been used in this district. At Nelson, B.C., a contract was let recently for 20 miles of aluminum wire which will be used for transmission purposes also.

A proposal was made to the Hydro-Electric Power Commission by gentlemen concerned in the electric railway project which is designed to connect Guelph and Stratford. Branches are also planned to Fergus and Elora and from New Hamburg to Woodstock via Plattsville. Eventually the road will come down to Toronto from the north-west. The system as at the present outlined covers some 150 miles, and the proposal made to the Commission is that the company should distribute Niagara power in such districts as the Hydro-Electric Power Commission does not penetrate. New Hamburg is prepared to bonus the company to the extent of $20,000 with the stipulation that it will undertake this work, thus bringing Niagara power into new fields. The company would use power obtained from the Hydro-Electric Power Commission for its own service.

Structural Steel Notes.

The Elgin county council awarded the contracts for two new bridges near St. Thomas. The Petrolea Bridge Co., and Hamilton Bridge Co., securing the contracts.

The Shore Line railway improvements in New Brunswick are being pushed along. Twelve steel bridges of a permanent character are either being constructed or planned.

Cornwall.—Tenders will be received until May 15th, 1909, for steel spans and concrete abutments for bridges. Address—Township Clerk of Charlottenburg, Cornwall, Ont.

Eleven bridges will be erected by order of the Middlesex county council this year. Work was commenced on the first of these a few days ago. It is situated near St. John's Ont., on the Proof Line road, and will cost in the neighborhood of $3,740.

The Alberta Provincial Government engineers have completed plans and specifications for a high level traffic and street railway bridge to be built at Edmonton at some point between Fourth and Ninth streets. The estimated cost of the structure is $300,000.

Damage to the extent of $25,000 has been caused at Port Hope by the over-flowing of the Ganeraska River. The following are some of the structures destroyed, viz., the Canton bridge, Helms' dam, the electric light plant footbridge, the Barrett's Hill bridge and the C.P.R. foot bridge.

At a meeting of the Navy Island Bridge Committee, in St. John, N. B., preliminary plans were submitted by F. W. Holt, C.E., for the proposed structure, which it is estimated will cost $750,000. The bridge will be a double decked structure, providing for railway, vehicular and foot traffic, and will be fifteen hundred feet in length.

Hon. John Morrissy, Chief Commissioner of Public Works awarded the contract for the remaining four spans of the Fredericton-St. Mary's bridge. The successful tenderers were the Dominion Bridge Co., of Montreal, and the four new spans will cost about $60,000. The bridge when completed will cost about $272,000, the original estimate by Engineer Wetmore having been $275,000.

Planing Mill News.

Maguire & Sutherland have started a saw mill at Duck Mountain, Sask.

R. D. Robison & Son are starting a sawmill and shinglemill just across the Fraser River from Eburne, B.C.

Hart & Carlaw, who recently took over the old Scott planing mill at Galt, are equipping it with modern machinery.

A wealthy syndicate, whose personnel has not been divulged, plans to build large sawmills at Esquimalt Harbor, B.C., at an expenditure of over $300,000.

The Building, Lumber & Supply Co., composed of well known Orillia men, will put up a large factory at Welland. The factory and yards will cover four acres.

The Tomiko Mills, have been incorporated to operate a sawmill on the Temiskaming & Northern Ontario Railway. G. B. Ferguson, of Renfrew, Ont., is president.

The Cleveland and Sarnia Lumber Co., have purchased from Waldie Bros., of Spragge, Ont., a lumber limit containing 250,000,000 feet of lumber and a saw mill, the latter to be moved to Sarnia. The price is $1,800,000.

The lumber industry is booming in Nova Scotia and all the mills are busy cutting the logs. In some districts tht cut promises to be heavy. Clark Bros., who have been operating at Bear River, will cut in the vicinity of four million feet. Large shipments are now going forward to European ports.

An indication of the gradual improvement of the lumber business on the coast is the starting again of the Pacific Coast Lumber Mills, one of the largest plants in Vancouver. The mill has been shut down for several months, and during that time has fallen back on its stock. This is about depicted. "If conditions were not better, we would not be starting so soon," was the remark of G. F. Gibson, manager.

A new industry is being established in Winnipeg by the Winnipeg Excelsior Mills, a company which has been formed for the manufacture of a wood fibre material used for packing. The mill is now in course of erection. The plant to be installed will have a capacity of six tons of excelsior per day and can be operated by fifteen men. White poplar, which is considered to be the best wood for the purpose will be used and the company had several gangs in the bush during the past winter getting out the wood. A quantity of wood was also got out last winter, one year's seasoning being necessary after the wood is peeled before it can be handled at the mills. The wood goes through various machines which reduce it to long threads of fibre, which are then baled ready for market. The manager of the mills, F. J. Wellwood, said that he expected the plant to be in operation by May 10.

Building Operations.

A new flour mill will be built at Dresden this year.

J. G. Stormes will erect a carriage factory at Shedden, Ont.

The Watt Coupler Co. may build a factory at Woodstock, Ont.

The T. Eaton Co. will build a twelve-storey factory to cost $250,000 at Toronto.

The Farmers' Elevator Co., have plans for the erection of a new elevator at Melita, Man.

A brick building is being built at St. John to be utilized as a bakery and knitting factory.

The McCormick Co. propose to erect a sash and shade factory at St. Boniface costing $15,000.

The Murray Shoe Co. has taken out a permit for the erection of a factory building at London.

The St. Thomas Canning Co. purpose establishing a branch factory at Ridgetown this summer.

Chas. Robertson, Winnipeg, will build a 35,000 bushel elevator at Claresholm, Alta., for the Vancouver Milling Co.

E. F. Hutchings, of the Great West Saddlery Company, Winnipeg, will erect a large warehouse at MacLeod, Alta.

K. Burnett, of Nanton, Alta., has secured a site at Vancouver on which he will erect a large grain elevator and warehouse.

Construction will shortly commence at Eburne, B.C., upon a large elevator to be erected by J. C. White, of Duluth, Minn.

The Canadian Industrial Company, of Vancouver, B.C., will erect a large paper and pulp mill on a site on the Powell river.

A Hamilton nail and wire concern and a Winnipeg metal fencing company will likely build branch plants at New Westminster.

It is reported that $250,000 has been bequeathed with which to erect a building at Toronto to be known as the Burns Memorial.

It is stated that the new building to be erected by the Banque Nationale at Montreal, will be ten storeys high and will cost $1,000,000.

The I.O.O.F. Hall Association have purchased property at Toronto on which they will erect a new lodge building, to cost at least $60,000.

Whitte Bros. & Co., of Newark, N. J., will next year build at Berlin a branch factory for the manufacture of cloth-covered buttons, and dies.

Stewart & Witton have purchased the old Central church property, at Hamilton, on which they will erect a building to be used for light manufacturing purposes.

It is understood that Stopes & Fuerstman, Saranac Lake, N.Y., are preparing plans for the erection of two sanitariums, one at St. Agatha, and the other at Quebec.

Mayor Robinson, of Kamloops, B.C., has presented a scheme for the erection of a new city hall and the carrying out of other public works at a total cost of $100,000.

The East City Furniture Factory, Peterboro, is to be enlarged during the coming summer. An addition one-half the size of the present building will be built to the rear.

It is reported that the T. Eaton Co. has secured lots at Calgary, with a view to erecting a large departmental store. It is expected that the sum of $500,000 will be expended on site and building.

It is stated that plans have been practically completed for the erection of a new $3,000,000 hotel on Phillips square, Montreal. The present lessees of the St. Lawrence Hall are stated to be interested.

Taylor & Taylor, Brantford, are preparing plans for an addition to the factory of Gould, Shapley and Muir, that city, and for the proposed new factory for Harold Sanderson, at Paris, Ont.

There will be between 30 and 35 new elevators under construction along the G.T.P. within a few weeks, according to a statement made by J. E. Dalrymple, assistant freight traffic manager of the road.

Jos. Sawyer, Montreal, has prepared plans for a three-storey building to be erected there

for F. Harel. It will have electric lighting, open plumbing, hot water heating and metal ceilings. Cost of building, $55,000.

E. LeRoy Wills announces the formation of a syndicate of prominent Montreal and Sydney capitalists, with capital of $150,000 for the purpose of enlarging and reorganizing the Sydney, C.B., hotel. Salt water baths will be installed.

A number of passenger depots will be built along the line of the G.T.P. this summer. They have already been built at divisional points, but the next move will be to supply all the towns that have shown reasonable development. This work will be started in a few weeks.

George White & Sons, London, have postponed until next year the erection of their new $50,000 building, owing to Niagara power not coming here this year. Next year, Niagara power, or no Niagara power, the building will be gone on with. Meanwhile the firm will proceed with the erection of a warehouse in Brandon, Man., and a large lumber house in London.

General Manufacturing Notes.

John McKinnon has started a wood-working business in Wapella.

The stamp mills at Hedley, B.C., are again running. Forty stamps are in operation.

The Crescent Oil Company will erect a warehouse in the north eastern part of Hamilton.

Detroit capitalists are said to be about to establish automobile works at Sarnia this year.

H. A. Metler, St. Catharines, proposes to establish a basket and box factory at Beamsville.

Geo. Pedlar, of the Williams Organ Co., Chicago, proposes building an organ factory at Sarnia.

The North American Bent Chair Company are making extensive additions to their buildings at Owen Sound.

The Reid Press, will, it is understood, very shortly erect a $25,000 addition to their plant at Hamilton.

Among the important undertakings in view in the building line in Hamilton are a new building for Wagstaffe, Limited.

It is understood that the New Westminster Board of Trade will take active steps toward the establishing of an elevator there.

The E. Long Mfg. Co., wants to build a new factory doubling its present capacity and has asked the Orillia council for a free site.

The Speight Wagon Co., Markham, Ont., is having some difficulty in getting hands, so great is the pressure of work at their factory just now.

Shaw & Mason, Sydney, C.B., makers of Colonial anti-friction metal, will build a branch plant in the U.S., to look after orders arising in that country.

The Pedlar Manufacturing Company, Oshawa, have bought a building at Toronto, and after making extensive alterations will occupy it as a sample room and warehouse.

The Durham Furniture Co. has made a start at the biggest pile of logs Durham ever saw. It is estimated that there is probably in the neighborhood of 1,100,000 feet stocked up.

A number of St. Mary's and Owen Sound capitalists intend to form themselves into a cement company, and have taken a number of options on rock and clay land near St. Mary's.

E. M. Archibald is at present engaged in preparing plans for the Canada Iron Corporation, for their Torbrook iron mine development in Annapolis Co. They propose to develop an output of one thousand tons per day.

The Zymole Co., a New Jersey chemical concern, has been granted a license to manufacture pharmacal, toilet and other proprietary preparations in Ontario. The company's Canadian factory is at Windsor.

The McLeod Pulp & Paper Mills have started to make box board at Milton, Ont., and intend to manufacture paper in the near future. The pulp mills of the company are busy and are turning out about 80 tons of pulp a day.

The reported curtailment of the B. C. copper smelters is hardly correct. The Granby smelter is operating seven of its battery of eight furnaces at the present time, and has increased its capacity 25 per cent. during the past year.

Representatives of a big American packing house have been in West Toronto spying out the land in the vicinity of the local abattoirs, and it is understood that before very long the foundation will be laid of another big abattoir.

The Canada Smallwares Co., St. Mary's are getting in a large amount of new machinery. The building has been fitted with a steam heating plant recently and Manager McCrimmon expects it will be ready for operation within a short time.

It is stated that Campbellford is to have a pulp manufacturing company which will employ a large number of hands, and that the building will be erected in the proximity of the Northumberland Paper Mills, operations to commence in the near future.

The manufacture of dynamite at the Dunbar & Sullivan factory in Amherstburg commenced a few days ago. It is anticipated that not so much of the explosive will be required this year as last as the lake drilling will necessarily be harder and slower.

Work has been proceeding on the Selkirk, Man., Match Company's factory rapidly and the building is now nearly completed. Matches will be made from poplar wood, and the company are buying up large quantities of it now for their summer operations.

Nanaimo city council have been asked for cheap water and exemption from taxation for a few years by Wilson & Flumerfelt for the Vancouver Briquette Co., which is to build a $35,000 factory in Nanaimo, work to start immediately. Briquettes are manufactured from slack the waste from coal mines.

As an instance of the trade into Vancouver shipments by the Blue Funnel liner Oanfa, now unloading at Evans, Coleman & Evans' wharf, might be mentioned. On the manifest are 3588 ingots of pig tin, worth $105,560 ; 49,924 boxes tin plate, worth $250,000 ; 720 slabs of tin and 244 pieces of pig lead.

A. D. Dame, sales-manager for the Galt Art Metal Co., who has recently returned from a trip to the Pacific coast, reports that business in the west is exceptionally brisk. The Galt factory is running 24 hours a day and unable to keep up with the orders. Additional machinery is now being installed.

The Sydenham Glass factory at Wallaceburg was visited by a disastrous fire a few days ago in which nearly the entire plant was destroyed. The office, flint house, box factory and the new building in course of construction were the only portions saved, some ten buildings being burned to the ground. Manager T. B. Dundas estimates the loss at $125,000, which is understood to be entirely covered by insurance.

The fact that the Chatham Wagon Co. has practically decided to double the capacity of its present factory is taken as an encouraging sign of industrial recuperation. A two storey building is contemplated. The present capacity is 4,000 wagons and sleighs yearly, but with the building of the new addition and the installation of new machinery the company will discontinue the manufacture of sleighs, and devote its sole attention to wagons, the output of which will be increased to 8,000 a year.

The Manitoba Linseed Oil Mills Co., have opened their $75,000 plant at St. Boniface. The new mill, which has a daily capacity of 2,500 gallons, will be in continual operation. The plant comprises a combination frame and cement flax seed elevator of 30,000 bushels capacity. The seed is automatically carried from the elevator to the cleaner and thence into the crushing rolls and afterwards to the expeller. It is then automatically weighed into the rolls and the oil and cake meal are similarly weighed before they go into storage. From a bushel of seed weighing 56 pounds the proportion is 18 pounds of oil and 38 pounds of cake. Even the bagging machinery for the cake is automatic so that machinery is used in every place possible though there is a staff of about a dozen men engaged in the mill. There are five of the expellers or oil machines and the building is planned so that the capacity can be readily doubled.

Gas Items.

A storm early in April wrecked 50 derricks in the Tilbury oil fields involving a loss of $15,000.

The Imperial Gas Power Co.'s factory at Swansea, near Toronto, was damaged by fire recently. The company makes gas engines and wringers.

An important deal recently took place whereby the East Tilbury Canada Oil Fields, an English concern, took over about a dozen oil properties. A big movement toward the development of the field is anticipated.

One of the municipal gas wells at Medicine Hat, has been sunk to a depth of 965 feet, and a tremendous flow of three million cubic feet per day has been developed. Experts expect that this will eventually rival the famous C. P.R. gusher at Bow Island.

The terms on which the Volcanic Oil & Gas Company may be allowed to pipe natural gas to Windsor have been decided on between the city council and the promoters of the company. The franchise will contain a clause giving the company the right to sell to the Windsor Gas Company. It is stipulated that the gas must be refined, and the original prices outlined are increased slightly on this account. The maximum is 35 cents instead of 30 cents a thousand, with an increase to 40 cents at the end of the first five years and a further increase to 50 cents at the end of the second five years. The company will use eight and ten-inch mains to bring the supply from the Tilbury fields, and will lay only one line. Six months is set as the time limit for reaching the city. The company has agreed to pay $1,000 of the cost of submitting the franchise to a public vote.

Trade Notes.

Jones and Glassco, Montreal, have moved into new offices in the St. Nicholas Building, room 201.

Southern Wisconsin Foundry Co., Madison, recently installed a ten ton Northern Crane, 50' span, for their new foundry.

John Millen & Son, Montreal, have been appointed sale agents for the Simms British Magnetos for the Dominion of Canada.

The Premier Electric Light & Power Co., Wallaceburg, has installed a new boiler, manufactured by the Leonard Co., London.

The Allis-Chalmers-Bullock Company has been given the contract for putting in the turbine and generator at the Nelson power plant to complete the second unit at Bonnington Falls. The cost is about $75,000.

The Milroy Co., formerly the Milroy-Harrison Co., 196 King St. West, have enlarged their offices by taking in the adjacent store. The increased business necessitated the enlargement which will now allow them to carry larger stocks.

The Brandon Machine Works Co. is just completing two steel cages for the W. J. D. gaol. The cages are made of heavy boiler plate securely riveted together and the iron grating in front as well as the lock is ponderous in the extreme.

Fisher furnaces manufactured by Alfred Fisher, 103 West Munroe St., Chicago, have lately been installed in the plants of the following Canadian firms: Sommerville Ltd., Toronto; Penberthy Injector Co., Ltd., Windsor, Ont.; The Wolverine Brass Works, Chatham, Ont.

The Toronto Iron Works has put up the large standpipe installed in connection with the new waterworks system at Guelph, Ont., which is said to be the largest reservoir of its kind in Canada, the capacity being 500,000 gallons and the dimensions 30 feet in diameter and 100 feet high.

John Millen & Sons, Montreal, have added to their lines of automobile and bicycle block and roller chains, a complete line of transmission chains made by the Coventry Chain Co., Ltd., Coventry, England. These consist of block, roller and silent chains in all sizes and types. They will shortly put on the market a chain specially manufactured for use in fire-proof buildings where metal sashes are employed, replacing the ordinary window cords. Special sprockets to suit the chain will be carried in stock.

One of the largest contracts for cement ever placed in the Dominion of Canada, has just been placed by the Frank B. Gilbreth organization with the Vulcan Portland Cement Co., Longue Pointe, Que., through their agents the William G. Hartranft Cement Co., Ltd., Montreal. The order covers the entire cement requirements for the work and will amount to nearly 100,000 barrels of cement which will be tested at the company's storage bins, where it will be reserved under seal and shipped in carload lots to the job as required, thus assuring the contractor that the cement will be up to the standard requirements when received.

New Companies Incorporated.

The Berlin Table Mfg. Co., Berlin, capital $40,000; to manufacture furniture. Incorporators, W. May, H. T. May and J. Wurm, Berlin.

The C. J. Daniels Milling Co., Toronto; to manufacture poultry foods. Incorporators, C. J. Daniels, S. C. Daniels and W. H. Pettit, Toronto.

Ottawa Typewriter Co., Ottawa; capital, $40,000; to manufacture stationery. Incorporators, E. E. Batty, F. X. Laderoute and A. K. McLean.

The Standard Combination Motor Rim Co.; Toronto; to manufacture automobiles. Incorporators, J. S. Lovell, W. Bain, and R. Gowans, Toronto.

St. Clair Construction Co., Toronto; capital, $40,000; to do construction business. Incorporators, J. L. Ross, A. W. Holmsted and W. L. Carr, Toronto.

National Iron Works, Toronto; capital, $200,000; to manufacture iron and other metals. Incorporators, A. Mullin, F. Lane and T. A. Silverthorne, Toronto.

Mace Mfg. Co., Montreal; capital, $20,000; to manufacture ice cream freezers and novelties. Incorporators, A. H. Mace, R. T. Heneker and A. H. Duff, Montreal.

St. Lawrence Paper Mills, Ltd., Cornwall; capital $150,000; to manufacture pulp and paper. Incorporators, F. N. Johns, G. H. Sedgewick and L. Davis, Toronto.

The Ontario Lime Assn., Toronto; capital, $50,000; to manufacture sewer pipe, cement, etc. Incorporators, G. H. Kilmer, J. A. McAndrew and W. H. Irving, Toronto.

Ontario Sanitary Mfg. Co., Windsor; capital $40,000; to manufacture plumbing and sanitary supplies. Incorporators, F. A. Black, R. H. Evans and H. L. Evans, Detroit.

Muskoka Sand and Gravel Co., Toronto; capital, $40,000; to manufacture cement. Incorporators, W. Sandford, New York, and G. A. Marchant and H. L. Dunn, Toronto.

Mines Power, Ltd., Montreal; capital, $3,000,000; to carry on power, heat and light business. Incorporators, E. A. Wallberg, E. C. Warren and J. R. Nichols, Montreal.

The Dominion Sugar Co., Berlin; capital, $300,000; to extract, refine and manufacture sugar. Incorporators, A. Leslie, H. L. McDowell and B. Harrison, Walkerville.

The Wizard Furnace Co., Toronto; capital, $100,000; to manufacture heating apparatus of all kinds. Incorporators, J. E. Denise, C. E. Howarth and W. M. Weekes, Toronto.

Maple Leaf Portland Cement Co., Toronto; capital, $50,000; to manufacture cement, oils, paints and stones. Incorporators, H. Riley, J. E. Riley and E. C. Ironside, Toronto.

The Chaudiere Supply Co., Ottawa; capital, $20,000; to manufacture machinery and tools of every description. Incorporators, A. Wilson, G. G. Roe, and B. B. Pannett, Ottawa.

Leach & Sons, Co., Kemptville, Ont., capital, $40,000; to manufacture machinery and articles of iron and steel. Incorporators, Z. Leach, G. A. Leach and S. J. Martin, Kemptville.

The Marceline Company of Ontario, Toronto; capital, $3,000 to deal in metals and machinery. Incorporators, Marcel Wormser, New York; and B. Frank and M. L. Lowenthal, Buffalo.

Silver Lake Lumber Co., Eastman, Que.; capital, $100,000; to manufacture lumber. Incorporators, D. McMartin, Montreal; W. A. Cromwell and J. S. Rayside, Eastman, Que.

The Blakely Oil Co., Chatham; capital, $25,000; to develop and treat ores, metals and minerals. Incorporators, S. L. Blakely, R. L. Gosnell and P. S. Shillington, Blenheim, Ont.

The Unicell Bell and Signal Co., Montreal; capital, $19,000; to make electric bells, annunciators, batteries, etc. Incorporators, R. T. Heneker, A. H. Duff and W. S. Johnson, Montreal.

The National Boiler Washing Co., Montreal; capital, $250,000; to manufacture and instal machinery. Incorporators, F. H. Hopkins, R. A. E. Greenshields and R. A. C. McNally, Montreal.

The Maritime Engine Co., St. John; capital, $125,000; to construct and repair engines of all kinds. Incorporators, D. J. Purdy and H. R. McLellan, St. John, and J. A. Calhoun, Savannah, Ga.

The Boeckh Bros. Co., Toronto; capital, $250,000; to manufacture woodenware, brushes, brooms, paints and metalware. Incorporators, J. C. Boeckh, C. McC. Farringer and A. W. Wills, Toronto.

MacArthur, Perks & Co., Ottawa; capital $250,000; to engage in construction business. Incorporators, A. F. MacArthur, New York, R. W. Perks, London, Eng., and G. W. Volckman, Ottawa.

The Parry Sound Mica Felspar Co., Toronto; capital, $100,000; to crush and treat ores, metals and minerals. Incorporators, F. L. Young, A. Bergquest and J. G. Harris, Minneapolis, Minn.

The Chatham Wrench Co., Chatham, Ont.; capital, $10,000; to manufacture machinery, tools and hardware specialties. Incorporators, R. J. McG. Gardiner, W. D. Sheldon and J. Hadley, Chatham.

Maw Brakes, Ltd., Montreal, capital, $100,000; to manufacture the Maw patent brake and conduct general manufacturing business. Incorporators, H. Timmins, R. J. Dale and P. W. McLagan, Montreal.

The Wm. Cane & Sons Co., Newmarket; capital $250,000; to take over and conduct the woodenware business of the United Factories at that town. Incorporators, W. H. Cane, L. P. B. Cane and V. E. Cane, Newmarket.

The Severn Power Co., Toronto; capital, $150,000; to construct and develop a water power and deal in electric heat, light and energy. Incorporators, W. Graham, T. E. Mc-?cken and J. R. Roaf, Toronto.

The International Grain Shocker Co., New Liskeard; capital, $40,000; to manufacture agricultural implements and shockers. Incorporators, R. S. Macpherson, W. J. Emerson and B. Carruthers, New Liskeard.

La Cie Bedard, L'Assomption, Que.; capital, $95,000; to take over and conduct the business of T. Bedard, manufacturer of stoves and agricultural implements. Incorporators, T. Bedard, J. D. Martineau, and R. Labreche, L'Assomption.

Welland Tin Plate and Sheet Co., Welland; capital $150,000, to manufacture tin plate, terne plate, Canada plate, polished blue steel for stoves, galvanized sheets and steel sheets. Incorporators, J. Huxley, Pittsburg; A. B. Spencer and B. J. McCormick, Welland.

The Calgary Windmill & Pump Company, Calgary; capital $50,000, will erect in the near future a large factory for the manufacture of pumps, windmills, saws, etc. The officers of the company are: Thomas Armstrong, President; John McGowan, Vice-President; D. D. McGillvray, Secretary and General Manager; R. A. Brocklebank, Director.

Gas Appliances Wanted.

Siege Social & Ateliers de Construction, 106 and 108 Rue de Lourmel, Paris, France, write Canadian Machinery that their company owns 36 gas works in France and desiring to increase the consumption are in search of all appliances for lighting, heating or other domestic or industrial purposes. They ask for particulars and price lists from any Canadian firms who wish to introduce their goods in France.

Largest Shot Tower in Canada.

The Canada Metal Company, Toronto, have purchased from Somerville, Limited, Toronto, the shot tower and machinery located at the latter company's works, and will remove the plant to their new factory site near the Exhibition grounds, that city. A tower 200 feet high, the largest in Canada, will be erected and the machinery will be brought thoroughly up-to-date in order to produce a superior quality of shot.

Listowel to Have New Electric Plant.

By a large majority Listowel carried a by-law to instal an efficient electrical system at an approximate cost of $13,000. The central station and the 265 Tungsten lamps will be installed under the direction of C. H. and P. H. Mitchell, consulting engineers, Toronto. The central station contains in addition to the present equipment, a Robb-Armstrong high speed engine and one Swedish generator. Tungsten lamps will be used for both street and indoor lighting.

First Creosote Mill in Canada.

A one hundred and fifty thousand dollar company, nearly all of whose shareholders reside in the United States, recently established a plant at Weedon, on the Quebec Central Railway, for the manufacture of creosote, the first of the kind in Canada. The same management operates a creosote factory in New Hampshire. Wood alcohol and charcoal are first produced from the wood. The tar refuse is converted by a secret process into creosote. All kinds of hard wood are used. The reason for locating at Weedon was to be near a cheap wood supply.

A $10,000,000 Paper Mill.

An area of a thousand square miles on the south coast of Newfoundland has been purchased by a New York concern, as a result of negotiations with the new Morris ministry, and it is announced that it will be made the centre of extensive paper-making operations. It is understood that the plans provide for the erection, at a cost of about $10,000,000, of a plant with a capacity of 450 tons of paper daily. The locality includes a port which is free from ice all the year round, and it is said after the plant is in operation there will be a regular weekly steamer service between Newfoundland and New York.

Will Build Large Plant.

As stated in our April issue the Standard Sanitary Mfg. Co., Pittsburg, will locate in Toronto. They have purchased the jobbing house of the Sommerville Co., Ltd., in Toronto, Can., and will continue the business under the name of the Standard Sanitary Mfg. Co., a Canadian corporation, which will be subsidiary to the American company. Papers of incorporation of the new company have been taken out under Canadian laws. The Standard company has also in contemplation the erection of a large plant in Canada which will be of a size sufficient to meet the demands of the Dominion trade.

Canadians Interested in Mexican Water-powers.

Headed by Dr. B. Franklin Pearson, a Canadian syndicate has secured a concession from the Mexican Government for the construction of two dams on the Conchau River, at a cost of approximately $8,000,000, and will produce gold. The upper dam, for the purpose of generating electric power for lighting and manufacturing, will cost two and a half millions, and will produce power for Santa Rosalia, Parral and neighboring towns. The lower dam will cost between five and six million dollars and will be devoted to flood water irrigation for three hundred thousand acres of farming land in Concha valley. Construction on this dam is to start this year, and will be completed in three years.

Maple Leaf Harvest Tool Co., Tillsonburg.

Announcement has been made that the Maple Leaf Harvest Tool Works, Tillsonburg, owned principally by residents of Galt, have been acquired by the American Fork Trust, which controls all similar factories in North America, except one in Canada and one in the United States. The trust had no factory in Canada previous to the deal being made.

The intention of the trust is to manufacture export goods at Tillsonburg and the plant will be increased to four times the present capacity. The secretary-treasurer of the old company, C. K. Jansen, will manage the Canadian concern, and still retains his stock in the business.

New Metal Company.

The Hoyt Metal Co., St. Louis, Mo., has opened a Canadian branch to look after its trade in this country and has established a small plant containing six kettles on the Don Esplanade, Toronto, where are manufactured babbit metal, stereotypers' metal and solder. If the product meets with favor and the trade proves worth while it is likely a large plant will be built in Ontario within two years' time, wherein will be manufactured a great many white metal lines, especially pipe, bends, sheet lead and white lead and perhaps a shot tower will be added.

G. F. Allen, chemist and metallurgist of the company, who was, until last December, superintendent of the Hoyt Metal Co.'s plant at Granite City, Mo., is in charge of the Toronto plant.

Big Transcontinental Bridges.

The huge cement foundations for the G.T.P. steel bridge at the Pembina river, which will be the largest bridge on the new Transcontinental system have been completed, and stand ready for commencement of the construction of the steel frame work. There are eight cement piers in the foundations of the bridge, which rival in size those on the G.T.P. bridge at Clover Bar. The bridge itself will be 225 feet in height from the water's edge, and will total an outlay of about $250,000. The steel for the bridge will be shipped in immediately the line reaches the Pembina, which will be in July or August.

Work on the construction of the foundation of the railway bridge at the Macleod river, for which it is expected Gunn & Co. will have the contract will be commenced this fall, and the bridge will be completed next summer. It will be as large as the bridge across the Pembina.

Betts-Brown & Co., Montreal, Secure English Agency.

Betts-Brown & Co., 433 Guy Street, Montreal, have secured the agency for Ontario and Quebec for Schonfield & Co., London, Eng., one of the largest dealers in Great Britain and the continent of Europe, in iron, steel, bar iron, weld steel bars, angles, tees, channels, joists, boiler plates, steel sheets, brass and copper sheets and tubes, etc., steel nuts and bolts, tin plate, terne plates, Russian iron, pig iron, etc., also machine tools and engineering tools of all descriptions of British and foreign make.

Among the machines to which Messrs. Betts-Brown & Co. will give special attention are the patent universal revolving parallel vise, containing seven tools operated by means of a level, and the Vulcan Patent Universal Spring Sledge Hammer, which does away with the striker in the blacksmith shop. Messrs. Betts-Brown & Co. have recently fitted up an up-to-date machine

shop, equipped to handle all kinds of special machine work, architectural iron work, and general repairs.

Important Hydro-Electric Development.

The Grand Falls Power Company, which is to spend about $5,000,000 in the development of a large hydro-electric plant at Grand Falls, New Brunswick, will purchase the permanent equipment for the plant through its New York office 542 Fifth Avenue. The main power house will be equipped, when completed, with eight units of 10,000 h.p. capacity each. In addition to the large amount of power equipment that will be purchased for this installation, it is likely that the company will purchase a good sized equipment of machine tools for the machine shop it will be necessary to maintain in order to take care of so large an installation of power equipment. The power plant will be situated near the C.P.R., about 3 miles north of St. John and about 2 miles east of the State of Maine, and substations and long distance transmission lines will be established to distribute current in both New Brunswick and Maine. Work of construction has already been started by the contractor, Frank B. Gilbreth, 34 West Twenty-sixth Street, New York, who will purchase a great deal of additional equipment for carrying out the contract. The machine tools for the contractor's repair shop will be placed within the next two or three months.

Canadian Machine Tool Markets

ST. JOHN.

St. John's export trade is increasing very materially. Up to Saturday April 17, the exports to Great Britain and South Africa in the winter steamers amounted to $21,118,510 which is an increase of $526,114 over the same number of steamers a year ago. Indications point to 1908-09 being the banner season and the total value is expected to reach the $25,000,000 mark.

The export of lumber to the United States for the quarter ending March 31, 1909, is the largest in the port's history. The value of the product of American logs in that period is given as $224,881.99 as compared with $42,539.32 for the corresponding period in 1908. The total value of exports to the United States for the March quarter 1909 was $858,716.39 as compared with $280,700.21 in 1908, a gain for this year of $578,016.18. The exports of lumber to transatlantic ports for the first quarter this year show a failing off of 7,500,000 feet in deal shipments while there is a slight increase in the birch timber trade.

WINNIPEG.

The Winnipeg Industrial and Development Bureau, which has been recently formed here, has booked many enquiries from manufacturers during the past few days, regarding the outlook of opening industries in this city. These enquiries cover many branches of manufacturing.

A Glasgow house proposes to open a Canadian branch for the manufacture of fire fighting apparatus; two agricultural implement firms state that they wish to get more closely in touch with the western Canada market; three men who have worked in the west for eastern concerns propose to open a factory for the manufacture of ornamental iron and brass work, and metallic office specialties; one firm proposes to start a shop for making hardware specialties and kitchen utensils; and two firms manufacturing gasoline and gas engines propose a Canadian factory, not only for the Canadian trade, but to take advantage of the preferential duty with the British colonies, with whom they already have a heavy business. In addition to these there are manufacturers of cotton gloves, traction engines of the "caterpillar" type and similar concerns looking for an opening.

A recognition of the fact that there is at present in the Canadian west a considerable amount of capital for industrial development, has had much to do with the interest being taken. If this capital can be invested in legitimate manufacturing industries, outside concerns feel that not only will it give good returns, but it will help materially toward the development of the country. A committee of the bureau has charge of these enquiries and wherever possible makes suggestions as to location or the securing of funds.

The Stuart Machinery Co., the large machine jobbing firm of this city, report a mammoth trade this spring in milling machinery. They are recovering from a $25,000 fire sustained on March 18th, in which they lost $5,000 worth of belting alone and many thousands of dollars worth of small tools, and wood equipped machinery. They will erect an up-to-date office and warehouse this coming season at a rather advanced figure. The Fort Francis door and sash factory is being equipped at the present time with milling machinery from the Stuart house. Peter Lyall, the famous Canadian contractor, is also receiving power machines, and electrical generators from the Stuart Co. for the Union depot construction work.

A greater part of the month of March was spent by representatives of the allied trades of the C.P.R. mechanics in preparing schedules to be submitted to the company's officials. The conference was held in Winnipeg, although mechanics in Montreal and Vancouver were meeting at the same time and submitting suggestions to the Winnipeg body.

The chief problems which faced the mechanics were, proper representation on the conciliation board, the restoration of rights to senior employes, and the matter of union shops.

The company received the mechanics' appeals very favorably, and passed upon the various petitions with practically no opposition from any member present.

The threshing machine business has not opened up well this spring in western Canada. All companies are working hard to land orders for the fall business, but they come in slowly.

Many companies report extensive sales for ploughing engines, and up-to-date this is the greatest part of the business which has thus far been done.

The late spring has seriously impeded the sale of threshing machinery and if the season is progressive there is no doubt that the trade will be good during the summer. It will depend largely upon the crop outlook as to whether there will be increased sales. The Sawyer & Massey company report the outlook good from the fact that the acreage under cultivation is materially increased.

Although thresher companies endeavor as much as possible to secure orders months ahead of time, yet many farmers who contemplate buying will not do so until the threshing season opens, when machines can be had conveniently from local points. It has often been the case also, where orders were placed early, that when the crop outlook became discouraging the orders would be cancelled.

Among the recent developments in the machine repair shop business in this city is that of electrical repair shops which have opened up during the past few months. The James Stuart Electric Company have the largest and most complete shop in the city. It may be safely stated that thus far it has not been a highly remunerative branch of work, but under careful management it can be put upon a paying basis.

The difficulties in running a shop of this kind are these: The special machinery and tools required are very expensive in comparison with the volume of business to be done. The skill required to do the work necessitates high wages for the workmen who can do a fine piece of work in a short time and are consequently idle most of the time. To offset this second feature the above named company have adopted the system of paying high rates by the hour. In this way men are not continually engaged, but are only engaged when there is work to be done.

For the past few months motor repairs and new installations have shown a marked increase and little slack time has occurred. This condition will no doubt continue, and at any rate the management are quite certain that as electrical work becomes more popular in the growing city, it will become an extensive industry.

The Allis-Chalmers-Bullock Co., of Winnipeg, report a splendid outlook for the coming season in the machine trade. They are at present equipping the power plants of Calgary and Nelson with steam and electrical engines and machinery. A few days ago the company completed the equipment of the Maple Leaf flour mills at Kenora, with milling machinery and power plant. This is one of the largest mills west of Fort William, having a capacity of 2500 barrels per day.

H. A. R. Macdonald, secretary of the Portage La Prairie Board of Trade was in the city a few days ago conferring with manufacturers with a view to having them establish quarters in Portage La Prairie. He is very enthusiastic over the outlook and declares that the present year promises to be very successful. A by-law was submitted to the citizens a few days ago meeting certain requirements of the Waterloo Manufacturing Company, conditional upon locating in Portage La Prairie. The terms of the company were quite satisfactory to the city council and the by-law will unquestionably pass with a large majority.

There will be a third telephone exchange built during the coming summer in the western part of the city to accommodate the rapidly growing residental section of this part.

The Williams Machinery Company whose premises are now on Notre Dame Street, in Winnipeg, are having plans prepared for a four storey warehouse estimated to cost $40,000 which will be erected in another part of the city. The material used will be brick and re-inforced concrete. The foundation will be built to sustain six storeys to which height it is expected the warehouse will eventually be carried.

D. B. Hanna, third vice-president of the C. N.R., who was in the city a few days ago on a business trip, said: "Every car works in Canada is now busy manufacturing cars for the Canadian Northern Railway, and there will be $2,000,000 worth of equipment for the western lines delivered before the harvest season. Of the new equipment there will be 2,000 box cars and a large number of refrigerator and passenger coaches."

A. HARKNESS.

TORONTO.

Business in the machine tool line is very good, a moderate amount of new work cropping out in different lines, wood working machinery, sawmills, machine tools, etc. The trade give encouraging views regarding the future.

A representative of Canadian Machinery made a personal canvass of a number of large dealers in western Ontario recently and all gave hopeful reports. In Galt the many manufacturers of machine tools were busy and were turning out some special lines in addition to regular machines.

The wood working industry is in good shape and McGregor, Gourlay Co., and Cowan & Co., were busy. The latter had in course of construction several carloads of machine tools for the Canadian Fairbanks.

The boiler industry has picked up during the past three weeks and there is a happier tone in the builders' reports. The boiler business is the last to feel the upward movement. The greatest demand in the boiler line so far is for return tubular boilers and a great number of these are being shipped to the West.

MONTREAL.

A cheerful tone underlies nearly every industrial line, all feeling the effects of the increased trade. The dealers in machine tools report some good orders. The wood working tools are selling well and one dealer is keeping a western Ontario manufacturer busy with orders.

A number of new machine shops are starting in Quebec, which will require equipment but these orders will all be small.

There has been a marked improvement in steam specialties. There is an increase in the number of inquiries and there is a decided gain in the number of orders. The increase in building operations has stimulated this and it is expected that a still greater increase will follow.

CATALOGUES.

STEEL TAPES—From L. S. Starrett Co., Athol, Mass., booklet describing steel tapes manufactured by them.

FRICTION CLUTCH—Carlyle Johnson Machine Co., Hartford, Conn., full description of their friction clutches and their application.

MOTORS—Motor Talks No. 4, containing table for finding the current in a 3-phase circuit from Westinghouse Electric & Mfg. Co., Pittsburg, Pa.

ROLLER BEARINGS—From Hyatt Roller Bearing Co., Section No. 300M describing and giving prices of Hyatt standard bushings, high duty type.

RECORDERS—Series of papers on the manufacture of pressure gauges, master clocks, recorders, etc., from the Industrial Instrument Co., Foxboro, Mass.

TOOL AND CUTTER GRINDER—Pamphlet from the Stevens Co., Galt, give specifications and general description of their Universal grinder and list of attachments.

FRICTION CLUTCHES—From Carlyle Johnson Mch. Co., Hartford, Conn., catalogue D 1909. The clutches for machines, countershafts and line shafts are described.

MACHINE TOOLS—Catalogue from Burke Machinery Co., Cleveland, Ohio, describing milling machines, drill press, tapping machines, cutting-off saws and saw grinders.

SHAPERS—From Gould & Eberhardt, Newark, N.J., catalogue of high duty shapers and attachments. The prominent features of the shapers are described and well illustrated.

BALL BEARINGS—From New Departure Mfg. Co., Bristol, Conn., a treatise on their two-in-one annular ball bearings on bond paper, well illustrated, showing their application to machinery.

EXPANDED METAL—Bulletin giving information in regard to structure of steel used, formulae for reinforced concrete design, etc., from the Northwestern Expanded Metal Co., 930-950, Old Colony Bldg., Chicago.

CHUCKS—From E. Horton & Son Co., Windsor Locks, Conn., describing their large line of churcks for cutting-off machines, car wheels, lathe and drill chucks. These are universal, two-jaws, independent jaw, etc.

THERMIT WELDING—Booklet from Goldschmidt Thermit Co., 103 Richmond St. W., Toronto, describing a number of repairs made by the use of thermit, welding motor cases, truck frames, armature shafts, etc.

SUPPLEMENTARY TURRET—Booklet ST—1 from the Bullard Machine Tool Co., Bridgeport, Conn., describing and illustrating the use of the supplementary turret, a multi-tool holder for the boring and turning mill.

MOLDERS' TOOLS—Catalogue of molders' tools from the Peninsular Tool and Specialty Co., 26 Pitt St. West., Windsor, Ont. Descriptions and prices are given of the standard molders' tools manufactured by them.

MACHINE TOOLS—From Garvin Machine Co., corner Spring and Varick Streets, New York, edition D of milling machines, grinding machines, tapping machines, lathes, etc. Catalogue is in German, French and English.

PUNCHES AND SHEARS—Catalogue 20 B, from the Buffalo Forge Co., Buffalo, N.Y., illustrating and describing portable forges, shears, punches, angle and tee iron cutters, riveters, ball bearing drills, exhausters, etc.

REACTIONS—First quarterly issue 1909 from Goldschmidt Thermit Co., 103 Richmond St. West, Toronto, Can., showing a number of interesting repairs made by thermit. These include repairs made in railroad shops.

CONCRETE CHIMNEYS—From The Weber Co., 929—934 Marquette Bldg., Chicago, a review of concrete chimneys giving their origin and development. A number of illustrations of reinforced concrete chimneys are given.

THERMIT—Book of instructions for the use of thermit in railroad shops from Goldschmidt Thermit Co., 103 Richmond St. W., Toronto. Directions are given for welding locomotive frames, driving wheels, connecting rods, etc.

DRILLS AND HACKSAWS—Catalogue from Hoefer Mfg. Co., Freeport, Ill., describing fully their drills and power hacksaws. It is on good paper, well illustrated and deals with automatic hub drills, bench drills, gang drills, boring mills, etc.

TOOLS AND MACHINES—From Brown, Baggs Co., Hamilton, catalogue, section A, 125 pages on coated paper, 10 x 6¾ ins. Various tools for tinsmiths and sheet metal workers are described including folding machines, forming machines, rolls, shears, etc.

GRINDING MACHINERY—Catalogue No. 12, from J. G. Blount Co., Everett, Mass., giving illustrated descriptions of grinding machines, wet tool grinders, truing device, buffing and polishing machines, and Blount speed lathes, both belt and motor driven.

MOTORS—From Canadian Westinghouse Co., Hamilton, circular 1164 describing type MS mill motors for polyphase alternating current circuits, squirrel cage rotors, constant speed. Applications of the motor are given in addition to the detailed description.

STEAM SPECIALTIES—Annual catalogue from Darling Bros., Montreal, illustrating and describing the special machinery manufactured and handled by them. These include all the requirements for heating apparatus for large factories and public buildings.

TUBE ON PIPE CUTTER—Catalogue No. 92 from Fox Machine Co., Grand Rapids, Mich., describing pipe cutting machines including the Fox heavy tube or pipe cutter, motor driven. These machines are used to cut off boiler flues, and by steamfitters, plumbers, etc.

ANNEALING AND HARDENING FURNACE—Booklet from W. S. Rockwell Co., Hudson Terminal Bldg., 50 Church St., New York, describing the Rockwell Rotory Annealing Furnace for brass, copper, steel, iron, aluminum, gold, silver and other metals using oil or gas fuel.

CEMENT—Illustrated catalogue from International Portland Cement Co., Ottawa. This handsome catalogue is a souvenir of the history and development of Portland cement. It describes the factory and gives tests of cement. A number of structures built of cement are illustrated and described.

CHAINS AND SPROCKETS—135 page catalogue from the Dodge Mfg. Co., Toronto, giving approximate horse power developed at the speed of chain noted. The sprocket chain is fully illustrated and described, also attachment links, elevator buckets, etc. The catalogue is very complete, prices being also included.

HOISTING MACHINERY—Fourth edition of catalogue from Georgian Bay Engineering Works, Midland, Ont. General specifications of hoisting engines are given, and descriptions of double cylinder hoisting engines, single cylinder hoisting engine, traveling derricks, drums, builders' engines, hand derricks, bond wheel grinders, pile hammers, buckets, cars, car wheels, cast iron split pulleys, etc.

MACHINERY AND TOOLS—551 page catalogue, 1909 issue, from Brown & Sharpe, Providence, R. I., describing their lines of milling machines, grinding, automatic gear cutting and screw machines, cutters, accurate test tools and machinists' tools. Descriptions of the various machines are given and much valuable information, rules and formulae are included in the catalogue. Several new machines, attachments and tools have been added and a list of these is included on colored pages in the centre of the catalogue.

TOOLS FOR SHEET METAL WORK—From Brown Boggs Co., Hamilton, Section A, 125 pages. The catalogues have been divided into three, A dealing with tinsmiths' tools and light machines for sheet metal work; B, with heavy sheet metal working machinery, presses, can making machinery, and C, evaporating machinery, etc. The catalogues are on coated paper and well printed. Catalogue A includes folders, wire cutters and formers, tube formers, rolls, shears, squaring machines, encased machines, standards, power groover, shears, hammers, etc. The catalogue is worth keeping on file.

DRAWING MATERIALS—33rd edition of catalogue from Keuffel & Esser Co., 252 Notre Dame St., Montreal and 127 Fulton St., New York, 540 pages, well illustrated. The general appearance of the catalogue has been much improved and it is well bound. An important change in the general arrangement of the catalogue has been made by creating a special section for "drafting office furniture," which is now forming an important department among the goods manufactured. Many additions have been made to the catalogue making it very complete. It will be sent free to engineers and companies on request.

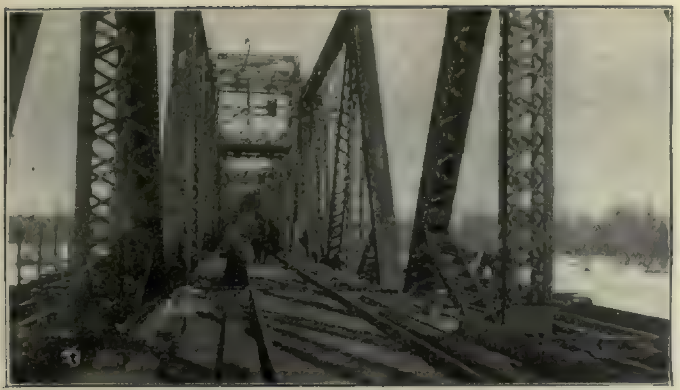


Fig. 1.—Prince Albert Bridge.

Fig. 2.—Prince Albert Swing Bridge at Right Angles.

Manufacture of Steel Bridges at Hamilton Bridge Works

Development in Bridge Building From the Points of Manufacturing and Erection—The Plant of the Hamilton Bridge Works Co., Hamilton.

In speaking of bridge-building, it might well be said that this is the age of steel. Where once wooden bridges were erected over rivers and canyons, now modern steel bridges have replaced them. With the advent of the latter class, efficient methods were evolved to manufacture and erect them, for, the members being much heavier than those of wooden bridges, it was necessary that something be done to facilitate the machining and handling the work.

The C.N.R. bridge being erected at Prince Albert over the Saskatchewan is an example of modern construction, that that almost impossible a few years ago. Fig. 1 shows a portion of the steel superstructure. The bridge consists of five 150-feet single track through riveted spans and one 260-feet swing span, and on each side of the bridge there is provided a 12-foot roadway for vehicle traffic. Under ordinary modern conditions this would be a comparatively simple piece of work, but owing to the fact that the conditions necessitated this bridge being erected during the winter time, the work was very difficult and expensive. For weeks and even months at a time the temperature was very severe, for a great portion of the time being 30 below zero and going as low as 50 and 60 degrees below zero.

Fig. 2 shows the swing bridge at right angles. It is equipped for hand-turning, but electricity may be used if desired. The weight of the superstructure is approximately 3,000,000 lbs. The bridge is an expensive one, and the Alberta Gov-

Fig. 3.—Modern Method of Erecting Girders.

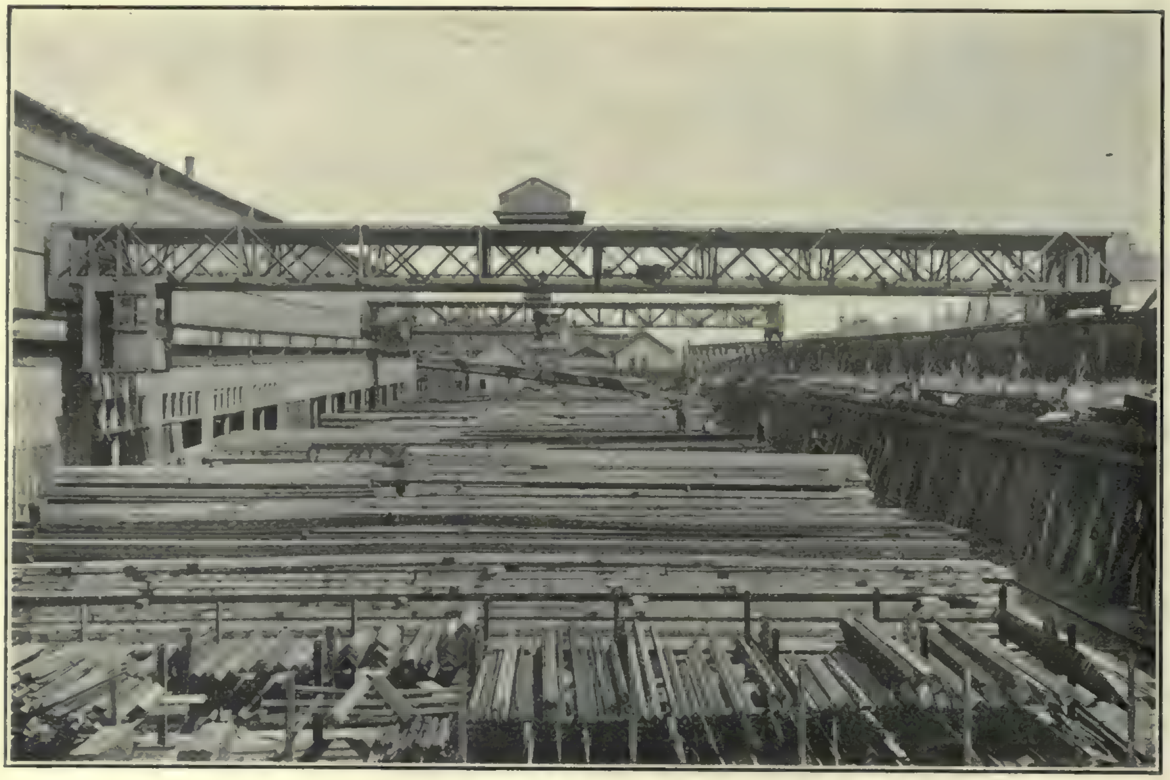


Fig. 4.—Stock Yards at Bridge Shops.

Fig. 5.—Stock Yards at New Shop.

ernment contributed towards the construction. The piers and abutments are of concrete. Both sides of the 12-foot roadway are protected by heavy steel lattice work so that should a horse get frightened there is no danger of its getting off the bridge.

Modern Erection.

The modern system of erection is illustrated in Fig. 3. This cut shows a steel erection car placing a 100-foot deck lattice girder in the C.P.R. bridge at Grand Falls, N.B. The bridge consists of four deck plate girders, four through-girders and one 325-ft, span.

Before the adoption of the erection car it was necessary to erect a false work so that it now takes much less time to erect a steel bridge. The Hamilton Bridge Works Co. have three erection cars in service in various parts of the Dominion. With an erection car is a companion car containing beds for the men, tools, etc., making a modern bridge-erecting outfit very complete.

Bridge Manufacture.

Great advances have been made in the manufacture of steel bridges and modern methods are best illustrated by a reference to the Hamilton Bridge Works at Hamilton. The large, heavy pieces are handled with surprising facility. When the material, angles, channels, I-beams, etc., are brought to the stock-yards from Pittsburg, the material is lifted by the 15-ton electric traveling cranes and piled in the stock-yards according to size.

Views of the stock yards are shown in Figs. 4 and 5. Another crane runs at right angles to the two shown in Fig. 4, further facilitating the handling of the heavy steel shapes.

The Bridge Shop.

The same modern manner of handling work is shown within the bridge shop. Five and ten-ton Rand air hoists are used as shown in Figs. 6, 7 and 8. These run on single tracks, some across the the shop and some lengthwise, as can be seen in Fig. 8.

Fig. 6 gives the best idea of the bride shop. It is built of steel and concrete, 465 feet long by 190 feet wide, with a capacity of 25,000 tons per annum. The power used is electricity, air and natural gas. The machinery is arranged for individual and group drive. Natural gas is used as fuel in the rivet heating furnaces and forges.

In the east end are a nut tapper for large truss rod nuts, steam hammers, a belt-driven hammer, upsetting machine, etc. The upsetting machine is for use on truss rods on combination bridges where a turnbuckle is used and will upset rods

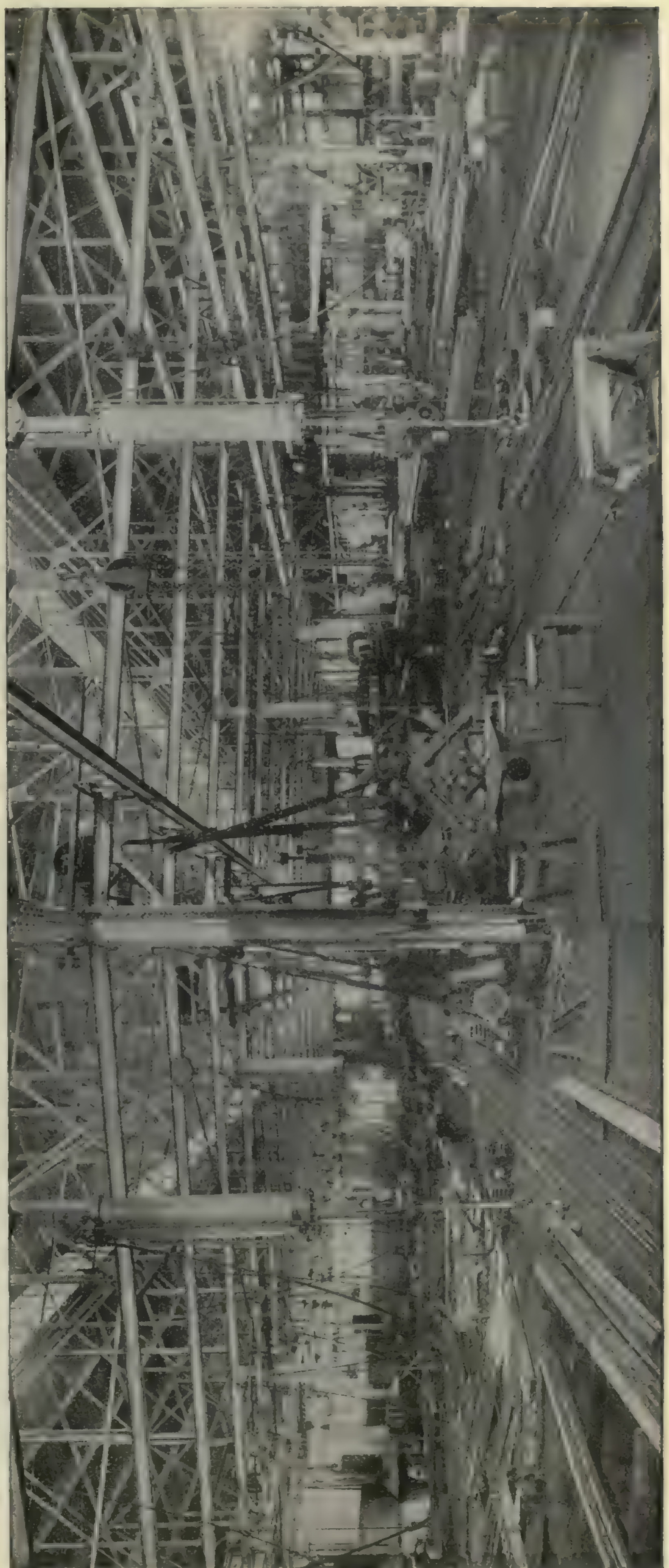


Fig. 6.—Hamilton Bridge Works Co., Interior Bridge Shop.

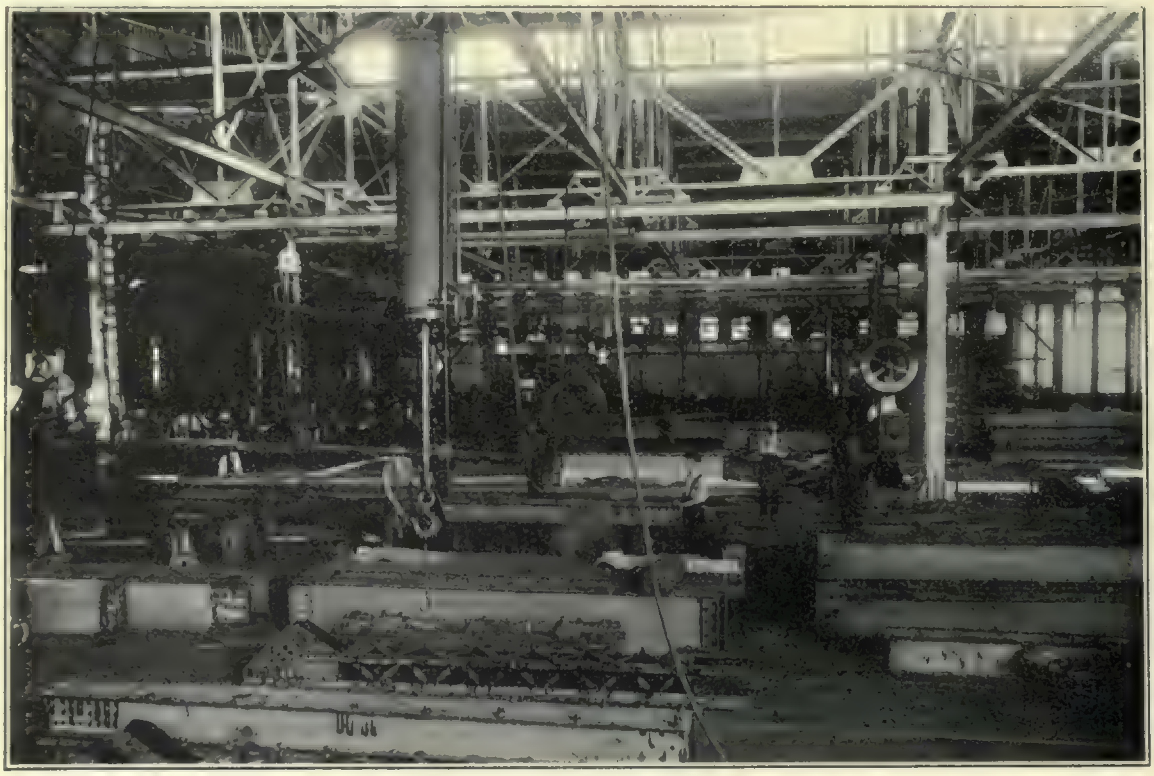


Fig. 7.—Assembly Floor in Bridge Shop.

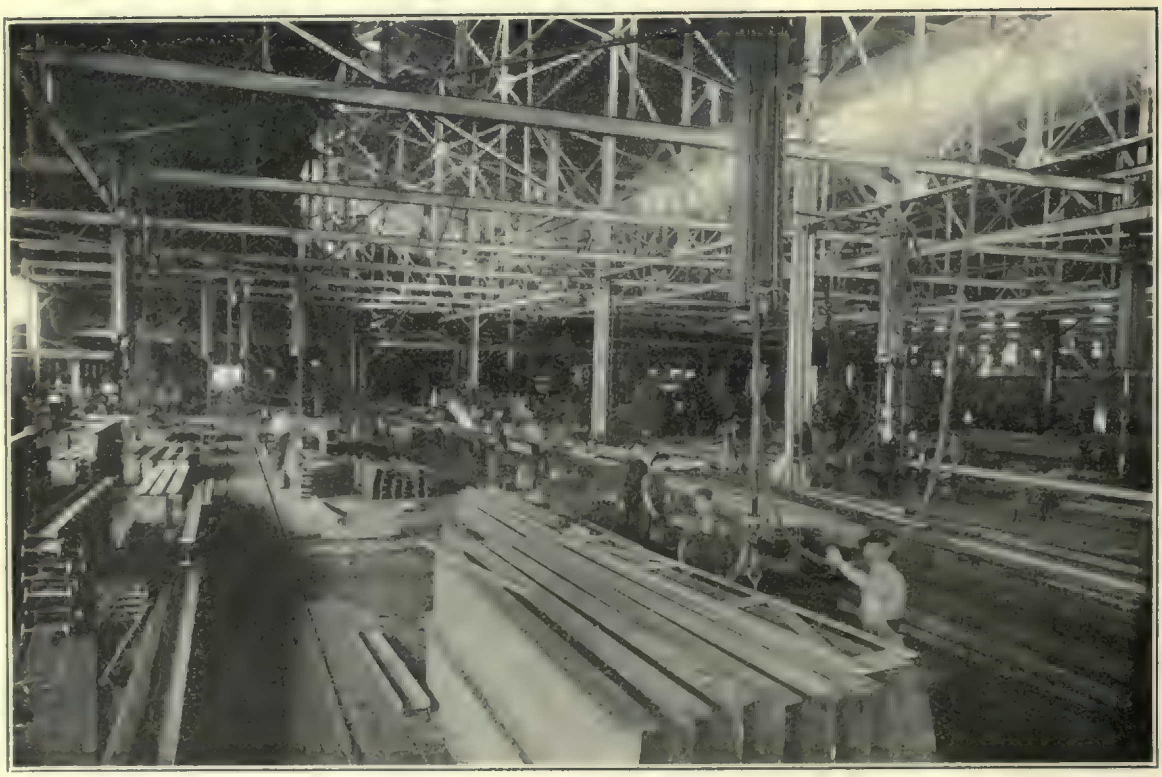


Fig. 8.—Main Bridge Shops.

from ¾-in. to 3½-ins. Fig. 6 is taken from the west end looking east.

In the foreground are the angle iron shears, with revolving table. It will cut angles 8x8x⅞-ins. Back of the angle iron shears is the John Bertram plate shears. It will cut plates 6 feet wide and 1 inch thick. In the back of Fig. 6 are the machines first mentioned. There are also two rotary planers, one with a 50-in. face and a smaller one with a 40-in.

Along the left side, Fig. 6, are the rivet furnaces and at the east end are a Wm. Sellers riveter and an I-beam boring machine, which will bore 35-ft. centres. In the corner is the superintendent's office and over it is the men's lunch room. This is provided with washroom, tables, chairs and all the latest technical papers. The men use this at the noon hour, and while enjoying a quiet smoke can peruse the mechanical journals.

Along the righthand side are jib cranes, and reaming machines. These each have a 22-ft. arm, with independent motor drive and are used to ream the holes that are drilled small.

At the east end is the power house, where the compressors supplying air power for the Allen riveters and Rand hoists and hand air machines are situated. Power is obtained from the Cataract Power Co. and one of the air compressors is run by motor. The other is run by steam supplied by a B. & W. boiler. In winter the exhaust steam is used for heating the works, a Buffalo Forge Co.'s system having been installed.

On the south side is a track below the level of the floor to facilitate loading bridge members. A system of narrow-gauge tracks, with turntables where necessary, further facilitates the handling of the heavy steel bridge members.

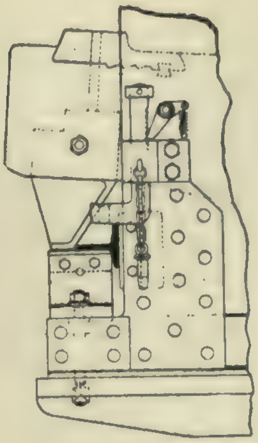


Fig. 9.

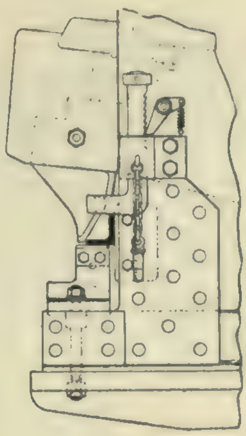


Fig. 10.

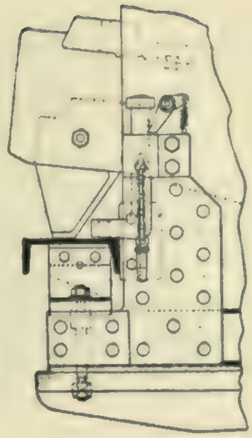


Fig. 11.

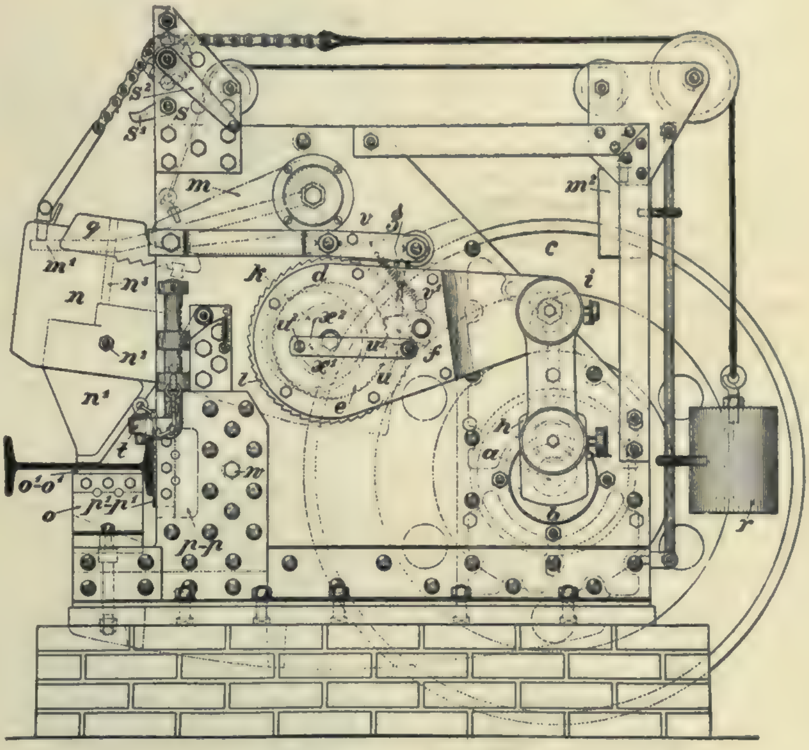


Fig. 12.—Johns Beam Shears.

Fig. 13. Steel Work of New Bridge Shops.

At the west end is situated the machine shop and above it the carpenter shop. The new machine shop shown in Fig. 13 has been erected and new machinery is being installed. The machinery is being moved from the machine shop at the west end of the bridge shop to make room for bridge work.

Johns Beam Shears.

Probably nothing shows the development in bridge building more than the invention of the machine shown in Fig.

12. It shows the machine ready to cut an I-beam, which is done in two operations. Fig. 9 shows the machine cutting a T-shape; Fig. 10 an angle, and Fig. 11 a channel. The machine is manufactured in Germany and it is one of the great time-savers used in bridge building. Steel shapes can be cut to length by the pulling of a lever, where formerly a power hack saw would saw off a very limited number in a day.

At the Hamilton Bridge Works there are two of these beam shears, which will cut 15-in.x42 lbs. to the foot in the bridge shop, and a 24-in.x100 lbs. to the foot in the new shop. The machine and work is handled by two men with the aid of an air hoist.

Pattern Shop.

The pattern shop is upstairs at the west end and contains the necessary machines for pattern work. Here the shapes are laid out for the different bridges, so that workmen in the bridge shop know exactly what they should do, making a great saving in time, besides allowing the foreman more time to devote to his other work.

New Machine Department.

Fig. 13 shows the steel work of the new shop when in course of erection. It contains a full equipment of tools, as well as overhead tracks and air hoists. A narrow-gauge track connects it with the bridge shop. All the machines are on concrete foundations, with a concrete base on which to test bridge turntables before they leave the works.

Among the new machines being installed in this department are two 40-in. John Bertram radial drills, two 60-in.x 20-ft. London Machine Tool Co.'s planers, one 60-in. Bertram boring mill, and three new lathes, 36-in., 24-in., and 18-in., from Goldie & McCulloch. Three bolt-making machines with forges using gas as fuel are installed in this shop. At the back of this workshop is a storehouse, where portable boilers, block and tackle, etc., are kept in places prepared for them. The whole arrangement has been made from an economic viewpoint and is an example of modern practice in bridge building.

REAMING MACHINE.

Not so many years ago, it was the common thought that almost any factory whatever its equipment, could turn out machine tools at a profit, and probably it could then. But men everywhere have begun to realize that in the face of modern competition specialization of both product and equipment is demanded.

Into the manufacture of their line of drill presses, the Hoefer Mfg. Co., of Freeport, Ill., have put into use many new ideas and devices which they have designed and built for their own use.

Every mechanic has realized the difficulty in obtaining a true hole when reaming is done in a lathe or drill press, and this difficulty is augumented when the parts to be reamed have chambered holes, from then it is almost an impossibility to get the two ends of the hole to line up perfectly, even though floating reamers be used for this purpose.

To overcome many such difficulties which they had encountered in the manufacture of the spindle sleeve, pulleys

Reaming Machine.

and other parts of their line of drill presses, the Hoefer Mfg. Co. designed the reaming machine as they call it, as shown in the illustration. They have taken the base and column of one of their standard 16-inch drills, and to the base under the metal shield have fastened a special bracket which carries a crown gear and pinion transmitting the power from the pulleys to the spindle head, the drift hole of which is seen just below the cone pulley. Into this spindle head is placed a reamer shank having a No. 3 Morse taper. This reamer shank carries an adjustable shell reamer which can be so adjusted that a standard size hole is maintained at all times, and ends just above the reamer in a small pilot, which enters into the guiding arbor above it. This guiding arbor is held in the long ways rotating spindle carried by the column.

On the back of the spindle is cut a rack in which operates the cross spindle through the wheel and lever shown. The pulleys and sleeves are drilled in a drill press by means of a special cutter bar which extends through the cored hole of the sleeve, into a revolving bushing in the base of the jig, and which has two double ended cutters placed about one inch apart, one cutter roughing, the other sizing it to about .010 under standard size. The guide bar in the reaming machine is ground to a sliding fit for the pulley or sleeve, while the reamer is .001 smaller than standard. In operating the machine, the guiding arbor is raised by the spindle and the pulley is slid onto it. The spindle is lowered until the guiding arbor engages the pilot on the reamer bar and the pulley is forced over the reamer onto the reamer shank beneath by a slight pressure on the pulley by the operator. Since the two bars, the one above and the shank beneath the reamer quite closely fit the hole before and after reaming, any error in the alignment of the hole is fully corrected.

The upper and lower corners of the reamers are stoned off by a small oil stone and the result is a very smooth hole. The work as turned out by the machine is very accurate, as it is almost impossible to detect any varation with micrometers. This reaming is done by the drill press operator, near whose press this machine is placed, while the hole is being drilled.

By means of this method of reaming, it is found that a far better bearing is obtained in the pulleys and sleeves for the shafts and spindle.

OBITUARY.

C. E. Kilmer, electrical engineer, of Kilmer, Pullen & Burnham, McKinnon Building, Toronto, met with an unfortunate accident on Wednesday, May 19, at Walkerton, which resulted in the loss of his life. The firm of which he was a member represent the General Electric of Sweden, and they have been doing considerable business in Canada. This made it necessary for him to visit Sweden. He arrived in New York on Tuesday, and was in Toronto Tuesday evening. He went to Walkerton the same evening to visit his father, and was stepping from the train when the unfortunate accident occurred. The business will be carried on by Messrs. Pullen & Burnham, McKinnon Building, Toronto, electrical engineers, who were associated with him.

A Practical Cost System for a Manufacturing Plant

A Simple and Efficient System used in the Works of the London Machine Tool Co., Hamilton, Giving Excellent Results With a Minimum of Labor.

One who knows the value of a cost system would hardly believe it, but there are managers who think that the cost system is only another method of increasing office expenses. But this is not so. An efficient system with a minimum of outlay for outkeep is a valuable asset. The system must be complete, however, and give information of no uncertain character. It must show actual facts in relation to the business.

In the system installed in the London Machine Tool Co. complete shop costs are shown. The work done in the machine department is accomplished by a young man under the direction of the Superintendent, P. M. Yeates, while the material cost and total cost are kept by a lady clerk under the supervision of Richard Harding, the secretary, who designed the system.

The London Machine Tool Co., manufacture machine tools, and while this system is made applicable to the requirements of that company, it may suggest a simple practical system to manufacturers looking for information on costs and cost systems.

Parts are Numbered.

Every casting or part must bear a number and for convenience a letter prefixing a pattern number denotes the class of material from which the part is made. The patterns, whether brass, or cast iron, etc., come under the class of patterns and the numbers are prefixed by the letter P. Thus it will be seen that the number P—2400 in the illustrations refers to pattern No. 2400. All pieces from the bar or forge shop come under the heading of forgings and the number is prefixed by the letter F. Thus, F—2500 represents forging No. 2500. Every part made in the shop must bear a number.

Departmental Orders.

When an order is received, the main office makes an order to the drawing office in the form shown in figure 1, and all specifications must be put on this order. The drawing office in turn makes out an order to the works office on the form shown in figure 2, and this order bears the sales number which is put on the machine when completed, and also the shop order number against which all labor is charged. This order is accompanied by complete specifications of the machine, giving the names and numbers of all its several parts, and also gives a list of all supplies going with the machine.

Enough copies of these specifications are made to supply all departments with a copy, and as each department does its work on the different parts they are checked off. Every morning these are gathered in, and the check marks are duplicated on the copy in the works office. This, as can be seen,

MAIN OFFICE
LONDON MACHINE TOOL CO., LIMITED
HAMILTON, CANADA

DATE ....
SHOP ORDER ....
SERIAL NO. ....

DRAWING OFFICE

Prepare the necessary drawings and specifications for material and issue shop orders for

Whom for ....
Delivery .... *Route* ....

Machine Shop ....
Stock Room ....
Office ....
Lathe Dept. ....
Planer Dept. ....
Foundry ....
Blacksmith ....

Fig. 1.

DRAWING OFFICE
LONDON MACHINE TOOL CO., LIMITED
HAMILTON, CANADA

DATE
SHOP ORDER
SERIAL NO.

MACHINE SHOP

The following work is to be done and returns made to the main office of time for same

Whom for ....
Wanted .... *Route* ....
Completed .... *Supt.*

Fig. 2.

DAILY TIME CARD

MACHINE NO. 37

EMPLOYEE'S NO. 70 DATE Apr. 10 1909

SHOP ORDER NO.	PATTERN NO.	FORGING NO.	TOTAL NO. OF PIECES WORKED ON	NO. OF PIECES COMPLETED	NO. OF HOURS Day Work	NO. OF HOURS Prem. Work	REMARKS
2776	2400		12	12		8	
"		2500	3	3	2		

SIGNATURE OF FOREMAN J. Smith

Fig. 3.—Daily Time Card.

L. M. T. CO. FORM 120

MACHINE SHOP ORDER NO.

	DATE	PART NUMBER	NO. PIECES	MACHINE NO.	EMP. NO	Hours	RATE	LATHE	PLANER AND SHAPER	BORING AND TURNING	MILLING AND GEAR CUTTING	DRILLING	SLOTTING	GRINDING	FORGE	VISE	ERECTING	MEMO.

Fig. 4.—For Practical Cost System.

enables the superintendent to see at a glance the amount of work done on a machine, and greatly aids him in setting a date of delivery. Along with the specifications the drawing office also sends complete drawings, each part being on a separate sheet, and unless the drawing of the part is difficult all detail drawings are made freehand. A great saving in the drawing office is thus effected, and in time the draftsmen get so expert at it that it is hard at times to discriminate between freehand sketches and those made by square and compass.

Day Work Cards.

Fig. 3 shows the daily time slip on which each man's time is recorded as shown. It must show the part number and the number of pieces, and also his exact time for the day work whether he is working day or premium. In the card shown in Fig. 3, workman No. 70 was working on casting 2400 for 8 hours and forging 2500 for 2 hours. The man's rate is 25cts per hour. The amount of time he works on day work, 2 hours in this case at 25c per hour is recorded according to operation on the sheet shown in Fig. 4. The work in this case was done on a lathe and the amount, 50cts., is entered in the lathe column. The castings were for an 18 inch lathe.

Premium Card.

His actual time "working premium" is recorded on premium record card shown in Fig. 5, and when the premium is paid the time recorded on the premium card, together with the premium, is recorded on the sheet shown in Fig. 4. Thus this sheet forms a complete record of the actual productive labor put on each machine or batch of machines.

The premium slip given to the man with the job he is to do is of the form shown on Fig. 6, and the foreman must put down the time he started and the time he finishes. The difference between his time allowance and the time he takes forming the premium, based at his rate per hour.

The time taken to turn 12 pieces on his lathe was 8 hrs. and the allowance is 9 cts. each, or a total of 10.8 hrs. for the twelve pieces. The premium is therefore 2.8 hours. The price paid for premium can be a fixed rate per hour, but in The London Machine Tool Company's system the rate paid for the saving in time is based on the workman's wages.

Form 119.

LONDON MACHINE TOOL CO. LIMITED
HAMILTON, CANADA

CONTRACTING EMPLOYEE NO. 70 PART FOR ORDER NO. 2776 NO. OF PARTS 12

Date	Part No.	No. Pieces	Emp No.	Hours	Rate	Total Time	Date	Part No.	No. Pieces	Emp No.	Hours	Rate	Total Time
4/10 '09	B# 2400	12	70	8	25	2 00							

Fig. 5.—Record Card.

Form 109 L.M.T.Co.

DAILY TIME CARD—PREMIUM WORK

EMPLOYEE NO. 70 MACHINE NO. 39

DATE 4/10 1909

SHOP ORDER NO.	PART NO.	OPERATION	NO. OF PIECES DELIVERED	NO. OF PIECES COMPLETED	TIME ALLOWED PER PIECE	TIME TAKEN	TIME FOR WHICH PAID
2776	B# 2400	Lathe	12	12	.9 hr	8 hr	10.8
			Started	4/10/7	A.M.		
			Fin	4/10/4	P.M.		

FOREMAN J. Smith

Fig. 6.—Premium Card.

Final Cost Sheet.

From the sheet shown in figure 4 the time on each piece for each operation is singled out and summarized on the sheet shown in figure 7, which is the final sheet. On this sheet all material is recorded, the weight and the cost in the rough being given. Thus by adding horizontally the total manufacturing cost of each piece is obtained. To this

COST SHEET
LONDON MACHINE TOOL CO., LIMITED

SHOP ORDER NO.

NO. OF MACHINES

Part No.	No. of Pieces	Name of Part	Lathe	Planer and Shaper	Boring	Milling and Gear C	Drilling	Slotting	Grinding	Forge	Vise	Erecting	Total of Labor	Labor Cost of One Piece	Weight of One Piece	Total Weight	Material	Cost per lb.	Total Cost of Material	Total Cost	Total Cost of One Piece

Fig. 7.—Cost Sheet for Practical Cost System.

is added all supplies and fixed charges, bringing out the grand total at the bottom of the sheet.

These summary sheets are filed away

under their shop number, and are used as a permenent reference. When machines are to be duplicated it is only necessary to refer to these sheets to know, after a comparison of the metal market, the exact cost of the new machines.

The methods of handling and keeping track of materials are as follows: For each pattern a card of the form shown in Fig. 8 is made up and filed. This card shows the location of the pattern in the pattern storage and also gives a record of when it goes out to the foundry and when returned and also to which foundry it goes. The foundry sign a shipping bill showing receipt of the pattern and if lost or destroyed while at foundry, the foundry is held responsible.

All castings are ordered from the specification sheets sent out from the

PATTERN CARD   FORM 101 A   L. M. T. CO. LT'D

.... MACHINE ....

PART

ISLE	SHELF	WOOD IRON	PATTERN
SENT TO		SENT	RETURNED

Fig. 8.—Pattern Card.

drawing office, the form of this sheet being shown on Fig. 9. The receiver, as the castings come in, records on his sheet the weight of each piece and when the list is completed these sheets are handed over to the Accounting Department and here the weights are transferred to the final sheet, shown on Fig. 7.

The same routine is carried out by the man looking after the bar stock. He cuts the required parts and his

TITLE 3 ft Radial Drill — Bed Works   DATE 1-21-07   Mach: Shop

Castings   REQUIRED ORDER 2770   NO. OF MACHINES 3

PAT. OR PART NO.	SHEET	DESCRIPTION	MATERIAL	AISLE LENGTH	SHELF DIAM	NO. OF PIECES REQUIRED	IN STORE RGH	IN STORE FIN	WEIGHT IN ROUGH OF ONE	SECTION	DELIVERIES DATES AND NUMBER OF PIECES	MEMO.
2675	2364/2	Inside column				1						
2676	2364/2	Column sleeve				1						KBMcG
2830	2369/2	Arm (2½ ft. drill)				0						
2829	2364/2	Arm (3 ft drill)				0						
2831	2369/2	Arm (3½ ft drill)				1						
2834	2380/6	Arm Gib				2						
2839	2368/2	Base				1						
2840	2367/4	Table				1						

Fig. 9.—For Practical Cost System.

sheets are turned over to the accounting department. From the receivers specification sheets a casting record card of the form shown in Fig. 10 is made out. This card gives a record of all castings in stock, and when they are used a requisition must be made for them and the number on the requisition is deducted from the number in stock.

FORM 112   L. M. T. CO., LTD.   CASTING RECORD CARD

PATTERN NO. .... FOR MACHINE NO. .... REQUIRED .... ORDER NO. ....

ORDERED FROM .... DATE .... 190....

ABOVE MENTIONED CASTINGS RECEIVED AS FOLLOWS:

DATE	NO. PCS.	WEIGHT	@		DATE	NO. PCS.	WEIGHT	@	

Fig. 10.—Castings Record Card.

At the end of the year the numbers shown in stock by the card must correspond with the number in the bins. A system similar to this is employed for keeping track of supplies such as screws, nuts, wrenches, etc. Fig. 11 is a requisition card and this is used by the foreman when he requires stock from the stores department.

A study of this system will show that accurate costs are obtained without any complicated methods being introduced. Simplicity is one point that should be aimed at in the installation of a cost system and it should combine with simplicity, completeness and accuracy and bring to the eyes of the superintendent the necessary information he should have for turning out the work as quickly as speed is consistent with good workmanship.

HARDENING ALUMINUM WITH COPPER.

Except where high tensile strength is essential, copper makes the best hardening adjunct to aluminum owing to the excellent pouring properties of the alloy, the contraction being low and the metal free from the tendency (characteristic of aluminum-zinc alloys) to crack in the mold. The high melting point of the copper renders it inadvisable to melt the two metals together, as the castings are liable to be spoilt by air bubbles. The better plan is to melt the copper first in a graphite crucible, covering the surface with charcoal, and then to add an equal weight of aluminum by degrees, the mixture being stirred between times, and becoming white hot in consequence of the thermal reaction. When poured into molds this alloy is white and brittle and can be crushed with a hammer. To harden ordinary aluminum-copper alloys—e.g. the usual casting alloy containing 42 parts Al. and 3 Cu.—with the 1:1 alloy, all that is necessary is to heat 39 parts of the former and 6.3 parts of

LONDON MACHINE TOOL CO., LIMITED
REQUISITION FOR MATERIAL

DATE ORDERED .... DATE RECEIVED ....
DEPARTMENT .... PURCHASING NO. ....
MACHINE .... SHOP ORDER NO. ....

FROM WHOM ORDERED ....

R D & Co. 4615   FOREMAN OF DEPT. .... CERTIFIED CORRECT.

Fig. 11.—Requisition for Material.

the latter in a crucible, and stir the mass.

C. H. Macmillan, formerly superintendent of the Dominion Iron & Steel Co., who has been recuperating in Maine for the past year has been appointed superintendent of the steel dedepartment of the company, and has taken up his new duties.

The United States steel industries are reporting great improvements in the steel trade, either in the tonnage of new orders secured or in specifications on contracts or in slightly higher prices for finished material. The demand for steel rails is improving and large sales are reported. Coke and ore contracts are also increasing.

REGULAR POLYGONS.

By G. D. Mills.

The accompanying diagrams are regular polygons, one having an even number of sides and the other an uneven number of sides. Fig. 2 is a table of formulas and Fig. 3 a table of constants to aid in calculations.

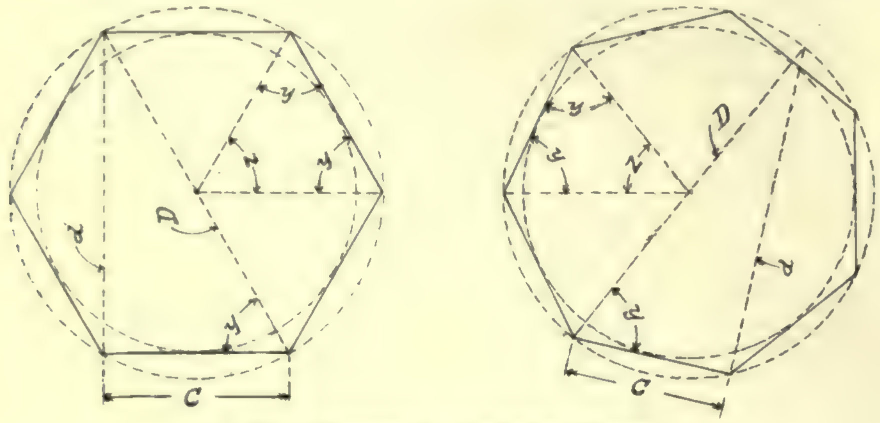


Fig. 1.—Diagrams for Calculating Polygons.

The formulas are derived from a right angle triangle which is dotted in each of the diagrams and may be briefly explained as follows: If we erect a right angle triangle on the side of any regular polygon, its vertical will be the inner diameter of the figure or d, its hypothenuse the outer diameter or D, and its base the length of a side or C. The apex of the triangle must necessarily fall on the outer circle providing the hypothenuse is drawn through the centre of the figure. From this it will be seen that we have only to determine an angle of the triangle to calculate its sides.

The center angle Z is readily found by dividing 360° by the number of sides and the desired angle Y by deducting ½ ½Z from 90°. Both of these angles will be found in the table of constants for figures of from 3 to 25 sides, together with the constants of sine Z, sine Y, cosine Y and tangent Y. Following will be found a few examples which serve to better illustrate the practical application of the formulas.

Example 1.—What diameter round bar shall we use to cut an octagon whose sides are to be 1¼ inches? In this case we require the outer diameter D, having the length of a side, C, or 1¼ inches. By referring to table of formulas, on line to find D, knowing C the formula, $D = \frac{C}{\cos. Y}$; and in table of constants, cosine Y for octagons is .3827. Our formula will therefore read $D = \frac{1.25}{.3827} = 3.266$ inches in diameter or about 3¼ inches.

Example 2.—If the distance across sides or inner diameter of a regular hexagon is to be 4½ inches, what will be the length of a side C? By referring to table of formulas to find the length of a side C, where the inner diameter or d is known, the formula $C = \frac{d}{\tan. Y}$ and tangent Y for hezagons is 1.7321. Our formula will therefore read $C = \frac{4.5}{1.7321} =$ 2.598.

If we desire to know the outer diameter or D, our formula will read $D = \frac{d}{\text{sine } Y}$ or $D = \frac{4.5}{.866} = 5.196$. If the area of the figure is required the formula $A = \frac{d^2}{\tan. Y}$ $\times \frac{N}{4} = \frac{4.5^2}{1.7321} \times 1\frac{1}{2} = \frac{20.25}{1.7321} \times 1\frac{1}{2} = 17.536$ sq inches.

Example 3.—If the area of a regular pentagon is to be 15.516 sq. inches, what will be the length of a side? By referring to the table of formulas where A is known to find C, the formula

$$C = \sqrt{\frac{A}{\tan Y \times \frac{N}{4}}} = \sqrt{\frac{15.516}{1.3764 \times 1.25}} =$$

3 inches.

Example 4.—What will be the area of a segment of a circle which is included between one side and the outer circle of a regular octagon whose outer diameter is 12 inches? In this case we must find the area of a circle 12 inches in diameter and deduct from it the area of the enclosed octagon which gives us the area of 8 segments, and as all are eequal, one-eighth of this is the required answer.

The area of a circle 12 inches in diameter can be found by squaring 12 and multiplying by .7854 or much more readily, by referring to a table of circles in which it will be found to be 113.098 square inches. The area of a regular octagon whose outer diameter is 12 inches, may be found by the formula $A = D^2 \times \text{sine } Z \times \frac{N}{8} = 12^2 \times .7071 \times 1 = 144 \times .7071 = 101.822$ sq. inches, and this deducted from 113.098 gives us 11.276 sq. inches. The answer is ⅛ of 11.276 or 1.409 sq. inches.

Knowing

Find	A	C	D	d
A		$A = C^2 \cdot \tan Y \cdot \frac{N}{4}$	$A = D^2 \sin Z \cdot \frac{N}{8}$	$A = \frac{d^2}{\tan Y} \frac{N}{4}$
C	$C = \sqrt{\frac{A}{\tan Y \cdot \frac{N}{4}}}$		$C = D \cdot \cos Y$	$C = \frac{d}{\tan Y}$
D	$D = \sqrt{\frac{A}{\sin Z \cdot \frac{N}{8}}}$	$D = \frac{C}{\cos Y}$		$D = \frac{d}{\sin Y}$
d	$d = \sqrt{\frac{\tan Y \cdot A}{\frac{N}{4}}}$	$d = C \cdot \tan Y$	$d = D \cdot \sin Y$	

Fig. 2.—Table of Formulae.

Example 5.—If a regular polygon is to have an area of 44.7 sq. inches, and its sides are to be each 2 inches in length, how many sides will the figure have? In this case we have the area and length

of a side, C. By referring to the table of formulas will be found formula $A = C^2 \times \tan. Y \times \frac{N}{4}$. As we have A and C and are to find tan. Y and $\frac{N}{4}$, we divide A by C^2 or $\frac{44.7}{4}$ which gives us 11.175 sq. inches and $\tan. Y \times \frac{N}{4}$ must equal 11.175. By referring to the table of constants and glancing along the column headed tan. Y, it will be seen that we must find a tan. Y which, multiplied by its proper $\frac{N}{4}$, will produce 11.175. Thus, selecting a 10-sided figure tan. Y is 3.0777, and multiplied by $\frac{10}{4} =$ $3.0777 \times 2\frac{1}{2} = 7.694$, which is insufficient Again, selecting a 12-sided figure, tangent Y is 3.7321 and multiplied by 3 gives us 11.196, which is the nearest to 11.175. The figure will therefore have 12 sides.

The tables will be found of great value and aid in other calculations which arise in daily practice and the three detached formulas also convenient at times.

$$A = C\,d\,\frac{N}{4} \qquad C = \frac{A}{d\,\frac{N}{4}} \qquad d = \frac{A}{C\,\frac{N}{4}}$$

$$Z = \frac{360^\circ}{N}$$

$$Y = 90^\circ - \frac{Z}{2} \qquad Y = \frac{180^\circ - Z}{2}$$

A = Area of polygon.
N = Number of sides.

COLD DRAWN STEEL.

The Union Drawn Steel Co., Hamilton, manufacture cold drawn steel in round, flats, squares, hexagon and special sheets. The operation of cold drawing is a very interesting one. A specially designed machine draws the steel jaws, grips the raw product and draws it to standard size. The steel has to be of perfect structure to withstand the tensile stress to which the bars are subjected.

The next operation is straightening the cold-drawn bars. The bars are fed over revolving rollers and if a defective bar escapes the drawing machine it cannot pass the straightening machine.

All sizes from 1-16 in. to 6 in. round are carried in stock, also flats, squares and hexagons. This steel is used for agricultural shafting, roller bearings, etc. Shipments have been made to New Zealand, but the tariff of other companies will not permit shipping from the Canadian works, but the Canadian business is now keeping them working to their capacity.

Turning a Large Shaft on Two Lathes

TURNING A LARGE SHAFT ON TWO LATHES.

The accompanying photograph shows how a shaft 27 feet 6 inches long by 10 inches diameter was turned by using two lathes. This necessitated no moving of either machine, as they had been lined up accurately when first set up. It will be noted that both machines are cutting, one working at either end. On each apron there is an extension so that whatever is missed, in the space between machines, by one tool, is reached by the other.

This shaft is one of three large propeller shafts being turned in the shop of the Hall Engineering Works, Montreal.

SOLDERING ALUMINUM.

According to La Vie Automobile, the best soldering medium for aluminum is an alloy of that metal and tin. The proportions vary according to the extent to which the soldered articles are intended to be worked; 45 parts of tin and 15 of aluminum forming a good solder, for such as are to be shaped afterwards. A harder solder, but less easily applied with the soldering iron, is prepared by melting 4½ parts of red copper, to which are then added 3½ parts of zinc and 4½ of tin, the heating being continued until a homogeneous alloy is obtained, which is cast into sticks.

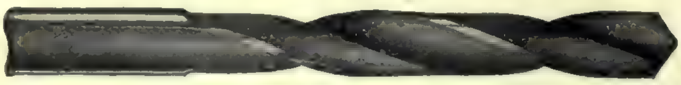
Sine Z	Sides.	Angle Z.	Angle Y.	Sine. Y.	Cosine Y.	Tan. Y.
.8660	3	120°	30°	.5000	.8660	.5774
1.0000	4	90°	45°	.7071	.7071	1.0000
.9511	5	72°	54°	.8090	.5878	1.3764
.8660	6	60°	60°	.8660	.5000	1.7321
.7818	7	51°—25'—43"	64°—17'— 8½"	.9010	.4339	2.0765
.7071	8	45°	67°—30'	.9239	.3827	2.4142
.6428	9	40°	70°	.9397	.3420	2.7475
.5878	10	36°	72°	.9511	.3090	3.0777
.5407	11	32°—43'—38"	73°—38'—11"	.9595	.2817	3.4058
.5000	12	30°	75°	.9659	.2588	3.7321
.4647	13	27°—41'—32"	76°— 9'—14"	.9709	.2393	4.0572
.4339	14	25°—42'—51"	77°— 8'—34½"	.9749	.2225	4.3814
.4067	15	24°	78°	.9781	.2079	4.7046
.3827	16	22°—30'	78°—45'	.9808	.1951	5.0276
.3613	17	21°—10'—35"	79°—24'—42½"	.9830	.1837	5.3499
.3420	18	20°	80°	.9848	.1736	5.6713
.3247	19	18°—56'—51"	80°—31'—34½"	.9864	.1646	5.9929
.3090	20	18°	81°	.9877	.1564	6.3138
.2948	21	17°— 8'—34"	81°—25'—43"	.9888	.1490	6.6353
.2817	22	16°—21'—49"	81°—49'— 5½"	.9899	.1424	6.9554
.2698	23	15°—39'— 8"	82°—10'—26"	.9907	.1362	7.2756
.2588	24	15°	82°—30'	.9914	.1305	7.5958
.2487	25	14°—24'	82°—48'	.9921	.1254	7.9165

DEVELOPMENTS IN MACHINERY

New Machinery for Machine Shop, Foundry, Pattern Shop, Planing Mill; New Engines, Boilers, Electrical Machinery, Transmission Devices.

NORKA DRILL AND CHUCK.

This drill is made by twisting a bar of special section, leaving a portion straight for the shank. This is ground to insure centering in the chuck, and the outside



Dig. 1.—Norka Drill.

of the drill is also ground so as to drill a hole round and true to size. The jaws fit into the straight grooves left for the shank and unquestionably hold with a grip that can only be disturbed by breaking the drill or the chuck.

The chuck has two heavy jaws, held by a substantial nut, which insures a

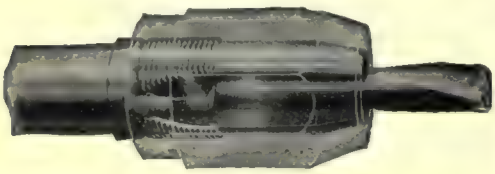


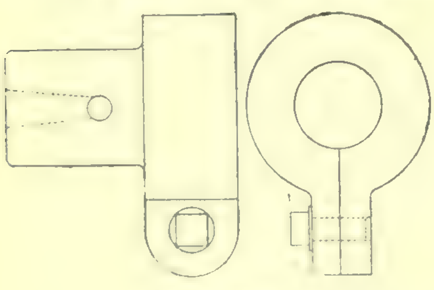
Fig. 2.—Norka Drill Chuck.

drive that will stand up to any work it may be called on to do.

Both drill and chuck are made by the Whitman & Barnes Mfg. Co., St. Catharines, Ont.

NEW CHUCK.

The chuck illustrated is made to fasten to a lathe tail-stock. In the accompanying illustration A is tapered to fit the Derrer tapered shank, but may be made to suit the ordinary tapered drill if desired; B is a drift hole and C is made to fit any tail stock. The chuck



New Chuck.

is fastened to the tail-stock by the clamping of the chuck.

The chuck can be used for boring cams, bushes, etc. The drill when in use bores steady and true and twist or flat drills of any length may be used. Reducing sockets does not lessen the trueness of drilling.

The socket is manufactured by the Elevator Specialty Co., corner Church and Lombard Streets, Toronto.

HIGH POWER I-BEAM AND CHANNEL HAND PUNCH.

The advantages, capacity, ease of operation and durability of the hand-power punch illustrated herewith makes it adaptable to all kinds of punching on I-beams from 5 ins. up to 12 ins., and the light weight, with its durability recommend it to structural steel users.

The strength and rigidity of the armor plate frame is seen at a glance, and the large punching power is very great, a medium sized hole is punched in plate thicknesses up to ½-in. The maximum capacity of this punch is one-inch holes in ½ in. plate, which would take a dead weight of over 47 tons upon the plunger, based upon a shearing strength, of the material being punched, of 50,000 lbs. to the square inch; which is equivalent to the ordinary steel used in bridges and structural steel work of all kinds.

This power is made possible by a combined 3-stage lever motion, which has a leverage of 1 to 2,200 from the end of a 6-foot lever to the shearing edge of the punch. This is equivalent to 2,200 pounds pressure at the punch with one pound pull on the lever; but does not include the power lost in friction of working parts, which is small for a machine of this kind.

The two frame plates are rigidly bolted and riveted together in a box form construction. The ratchet wheel is cut and hardened steel, upon which works the pawl and lever motion. It will be noticed that the lever-bearing studs are bolted through the frame, making them extra rigid, and that there are three pins in the lever handle, over which the first link is placed to secure a one, two or three-tooth movement of ratchet wheel. The ratchet wheel can be turned by a convenient handle to quickly adjust the punch to the work, as well as to run the punch up after completing an operation.

The plunger crankshaft, upon which the ratchet wheel is pressed, is securely supported by flange bearings, bolted to the main frame. The throw of the crankshaft is ¾ of an inch, and the motion is transferred to the plunger head by means of a heavy steel one-piece connecting rod, which has a width of the frame space, and is bored from the solid and bronze-bushed.

The planed sides of frame form guiding surfaces on two sides of plunger, while the main guides are bolted between the frame and have adjustable gibs which assure premanent alignment of punch and die. The die holder is a steel casting of improved shape and design adaptable to working on webs of channels, I-beams, etc. It is mounted on the frame and bolted by an extension machined to fit the frame space.

High Power 1-Beam Punch.

Heavy angle irons are riveted to the frame on both sides, making a substantial base plate. Its weight is 1,000 lbs., and can be mounted on truck for portable use. The machine is made by the Buffalo Forge Company, Buffalo, N.Y., and has been styled their No. 30 punch.

IMPROVED DIE HEAD.

The Improved Automatic Opening Die Head is composed of four principal parts, namely, the body, sliding collar, adjusting shell and die holders.

The body is of strong, close grained cast iron, bored and turned perfectly

true, standard size for interchangability of parts.

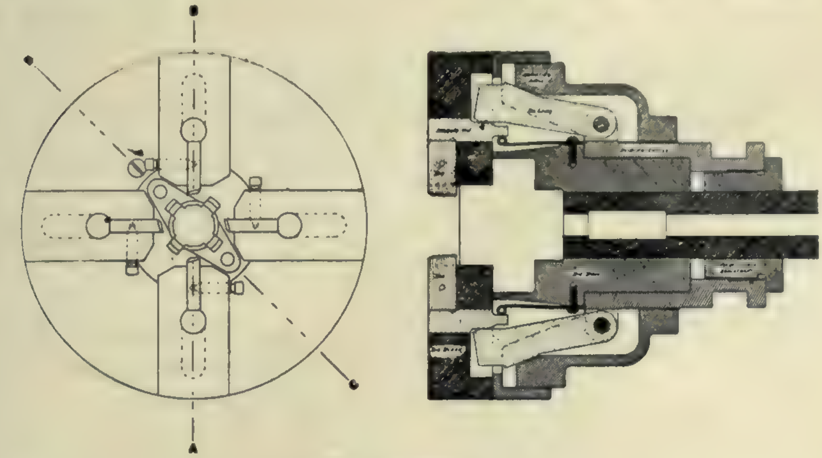


Fig. 1.—Section.

Across the face of the body are milled heavy T slots for carrying the steel die blocks. The outside flange of this part of the head is machined at the back internally as a guide for the adjusting shell and also serves to exclude cuttings from the working parts of the die head.

The hub is bored and keyseated for the steel driving shaft, the outside is fitted for the sliding collar to work upon.

The sliding collar is fitted part of its length internally to slide upon the hub of the body, the remaining portion threaded to receive the collar for adjusting the length of thread to be cut when machine is in operation. The exterior of the sliding collar has four lugs milled and drilled to receive the fulcrum end of the bearing levers, also thread upon which adjusting shell is carried and the recess to receive the shoe attached to the yoke for closing the die head.

The adjusting shell carried upon the sliding collar at the back and guided within the flange on the die body at the front, is the means of positive, universal adjustment of the dies through the double wedge action on the bearing

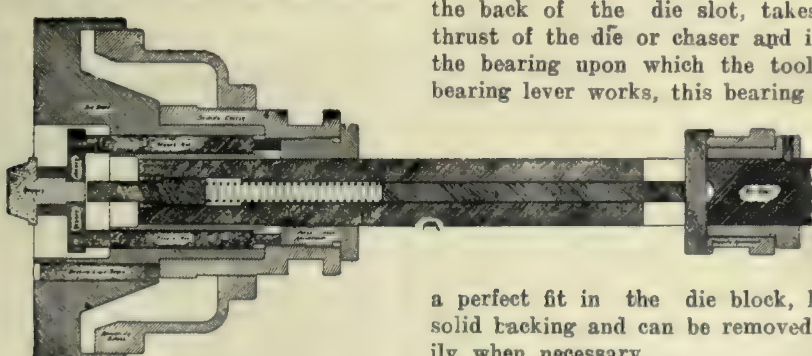


Fig. 2.—Section.

levers, plainly shown on sectional cut Fig. 1.

The die blocks are of machine steel, case hardened, carefully fitted to the slots in the die body, to exclude cutting and give extra long and durable wearing surfaces.

The tempered steel bearing pin forms the back of the die slot, takes the thrust of the die or chaser and is also the bearing upon which the tool steel bearing lever works, this bearing pin is a perfect fit in the die block, has a solid backing and can be removed readily when necessary.

The bearing levers are of tool steel, hung in the lugs of the sliding collar, tempered at the point of bearing on the bearing pin and turned to give ample bearing on the adjusting shell.

The dies are of the best tool steel obtainable, are plain, straight back, held firmly in position, each with one pointed set screw, entering pit in the die, making it quick and easy to change sets when desired. Dies may be recut from three to four times to original size before discarding.

The adjustment for light or heavy internal reaming is independent varied as desired and shown in sectional cut, Fig. 2. Owing to the construction, extra reaming tension that may be applied, will effect the reaming only when the thread is well through the dies where the heavy reaming will not cause a thin thread.

The reamer holder is malleable iron, part of its depth being squared to receive the square on reamer shanks. Reamers are held in place by a single pointed set screw.

Reamer rods attached to the reamer holder pass through long guide holes in the body of the die head and coming in contact with the adjustable collar in the back of the sliding collar, push the bearing levers off the bearing pins, allowing the die blocks to be thrown open by the positive spring action when the thread length has been attained, determined by the position of the thread length adjustment collar (see Fig. 2). To prevent accident the reamer rods are shouldered to strike the sliding collar should the adjustable collar be too far out.

When the die head is open the reamer holder with rods may be drawn out, permitting long or "running threads" to be cut. The adjustments for this die head are few, simple and quickly

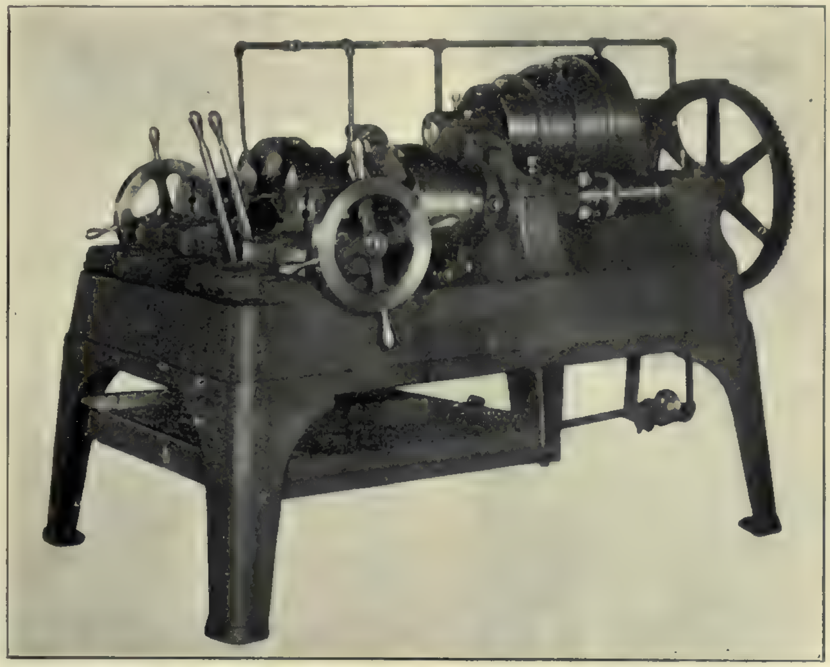


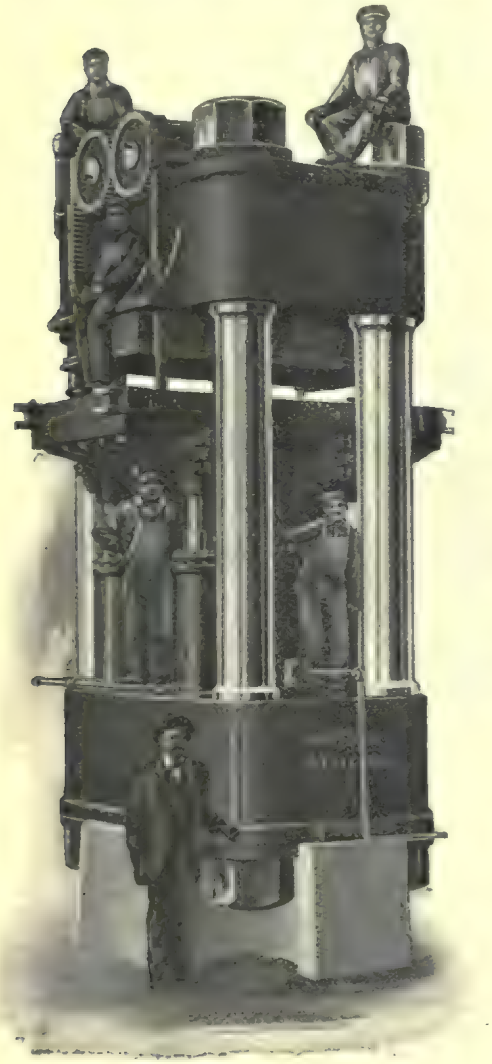
Fig. 3.—Improved Pipe Threading Machine.

made, but accomplish all that can be desired viz: size of thread, length of thread and any amount of internal reaming of the pipe end. Extreme adjustment both ways from standard size make it easily possible to rehob dies in these die heads.

This automatic opening die head is manufactured by the Murchey Machine & Tool Co., corner 4th and Porter Sts., Detroit, Mich.

NEW 4,000 TON HYDRAULIC PRESS.

Almost every large hydraulic press embodies some peculiar features or operates under unusual conditions. The Watson-Stillman Press shown in the illustration is interesting not only on account of its large size, but it was built under specifications which stipulated that the moving platen should not spring more than 1-100 of an inch under the maximum load of 4,000 tons.



New 4,000 Ton Hydraulic Press.

The machine was specially designed by the Watson-Stillman Co., of New York, to compress a plastic material to almost uniform thickness within a mold of which the upper and moving platen form the top and bottom faces respectively. The sides of this mold consist of a practically solid steel band 7 inches high and 5 inches thick, which rests on the moving platen while the material is under pressure. Absolutely uniform dimensions and great density of finished product are two essential requirements of the press. The extent to which these are secured may be inferred from the fact that the top of the mold clears the sides by about 1-64 of an inch and that 8,000,000 pounds pressure can be equally distributed over the mold (about 25 square feet in area and about 9 feet across the diagonal.)

To obtain this enormous pressure upon the material in the mold, an operating pressure of 5,800 pounds per square inch is required upon the main ram, which is 42 inches in diameter. With the exception of the ram, which is of chilled iron, all parts under stress are of steel. The three platons are steel castings, and the columns are turned of steel. The three platens are steel The cylinder is cast from nickel steel, which, as is well known, is far superior to ordinary carbon steel in strength and toughness, and permits of the lightest weight of metal to safely perform a given duty. This steel construction keeps the total weight of the machine to the comparatively low limit of 115 tons and also makes a press of much smaller dimensions than any cast iron machine of equal power.

The stroke of the ram is 18 inches, but the actual work of compression is accomplished through less than one tenth of that distance. A hydraulic accumulator is used to speed the ram up to load and the operating pressure is then taken direct from the hydraulic pumps.

After the material has been compressed, the mold is stripped by raising the sides. This is accomplished by simultaneously turning the operating pressure into the four 6-inch stripping cylinders. whose piston rods pass up through the moving platen and rest near the corners of the flask. Any inequality of pressure from the cylinders or tendency of the flask to stick in spots is prevented by racks and pinions, effecting the even raising or lowering of the flask.

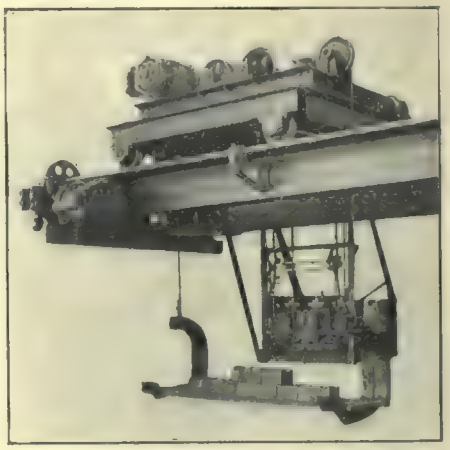
The two corners of the flask on each end are made to move uniformly by the intermeshing of the pinions at the centre, while the corresponding movement of one end with reference to the other is assured by mounting the two pinions of the same side upon the same shaft. It is thus evident that force exerted on one corner would be equally distributed to raise the whole flask. This prevents strain and bad alignment. The stripping cylinder rams have a travel of 23½ inches, so that they will bring the flask down into position on the moving platen when the main ram is at the extreme bottom of its stroke.

The main ram lowers by gravity when the operating pressure is released and thus sends the water in the cylinder back into the pump reservoir.

The press is manufactured by the Watson-Stillman Co., 50 Church Street, New York.

THREE-MOTOR ELECTRIC TRAVELING SCALE CRANE.

The cut accompanying this article illustrates a new type of scale crane. All movements are operated by electric power. The novel feature of this crane consists in the application of the scales for weighing material, which are supported on trolley truck frame and carry the hoisting mechanism mounted on independent steel frame work. The scale beams are in the cage suspended from the trolley and readings are taken and recorded by operator. There are three beams: two scale beams with self-recording poises, and one tare beam, enabling scale weights to be determined of several different items of material with utmost ease and accuracy. A simple movement of hand-lever transfers, when desired, all load from the knife edges of the scale to the trolley truck frame, and then operation is the same as with ordinary trolley.



Three Motor Scale Crane.

An open side platform is furnished as shown for carrying long pieces such as rods, bars, etc. The design of this platform is made to suit the material to be handled. A crane of this type is most useful in loading material, checking invoiced weights, and in loading for shipment, for inventory, etc., etc.

This crane was designed and is manufactured by the Whiting Foundry Equipment Co., Harvey, Ill.

POWER GENERATION AND APPLICATION

For Manufacturers. Cost and Efficiency Articles Rather Than Technical.
Steam Power Plants ; Hydro Electric Development ; Producer Gas, Etc.

TRANSMISSION OF POWER BY ROPES.*

Rope driving may be divided into two leading branches known as the American or continuous system, and the English or individual rope system.

Briefly described, the continuous system is that of winding a single rope as many times round both driving and

Fig. 1.—Continuous Rope Drive.

driven pulleys as there are grooves to fill, then conveying it from side to side as it completes the circuit by means of a "jockey" pulley fixed at the required angle upon a weighted slide, to regulate the tension automatically.

Size of Pulleys in Relation to Diameter of Ropes.

The first item in this connection is the relationship of ropes to pulleys in the matter of dimensions. The absolute point of detraction in power from the employment of relatively small pulleys cannot, of course, be determined with mathematical accuracy. Experience teaches, however, that it is not advisable to run a cotton rope over pulleys less than 30 times its own diameter without making extra allowance for loss of grip. Even then, be the alowance ever so liberal, this rule may not be violated without interfering with the vitality of the rope, which suffers from the strain of alternately bending and straightening in its passage over small circumferences.

Fig. 3 will serve to illustrate the detrimental effect upon a rope by bending

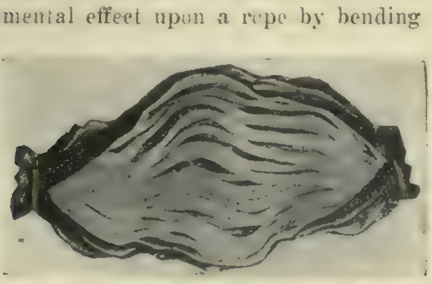


Fig. 2.—Kenyon's Inter Stranded Driving Rope.

round abnormally small pulleys. For the purpose of emphasizing, the circle round which this rope is fixed is only 14 diameters. By taking an angle of 45 degrees to represent the chord of the ogee arces forming the interstices of the strands at the horizontal portion of the rope, and carrying this angle through

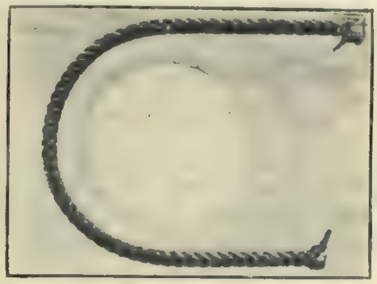


Fig. 3.—Showing Strains.

at its junction with the vertical centre line, the diameter is found of the small circle to which tangent lines are drawn from the bent portion, which graphically displays the extension of the outer periphery at the expense of the inner pitch of the rope. It will thus readily be seen how the circle could be so reduced that the grip of the rope would altogether cease.

* First of a series of articles describing the system of rope drive used by William Kenyon & Sons.

drive where the factor of safety is recognized, it is always as well to make some allowance where large and small pulleys are in close proximity, if only for the benefit of the rope. When both pulleys are the same size, juxtaposition in respect to arc of contact is no disqualification.

Trailing Span or Idle Side of Ropes.

Although there is a distinct increase in the arc of contact when the tight or working side of the rope is below the pulley, as shown in Fig. 6, this position is not always attainable, or even desirable. For instance, in cases where an erratic delivery of power is required, such as the driving of iron rolling mills, the shock is taken up by the ropes, which display every irregularity by a series of wave-like oscillations.

If the direction of rotation is reversed, the working strain being uppermost, prevents the ropes wandering from their appointed track, while the slack, still feeling the impulses, falls naturally away by its own weight. When irregu-

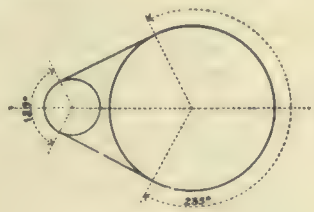


Fig. 4.

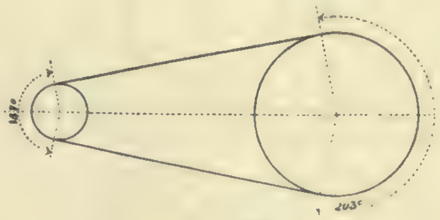


Fig. 5.

Arc of Contact.

The question now is, as to whether the amount of rope in direct contact with the pulleys influences in any way the power transmitted. This question may probably be best answered by reference to the two diagrams, Figs. 4 and 5.

Ignoring for the moment the curve represented by the "trailing span" and allowing straight lines to stand for the rope, it will be seen that, while the total contact remains the same, the respective arcs are governed by the relative distances between the two pulleys. Thus with the circles at close quarters, as in Fig 4, the arc of contact is represented as 125 degrees upon the small pulley. But as the distance between the pulleys is increased, the arc of contact also increases until the position represented by Fig. 5 brings it to 157 degrees, or a difference of 32 degrees between the two.

Although this implied detraction may not prove a realizable quantity in a

lar impulses are given off or in down driving, i.e., where the driven pulley is lower than the line of the driver, the trailing span may with advantage be allowed to fall below. Although such detractions differ with differing conditions, 10 per cent. is usually considered a sufficient allowance. With oblique driving the case is, of course, different, because

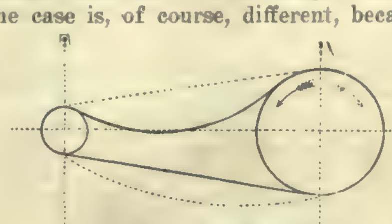


Fig. 6.—Trailing Span

of the check administered by its upward tendency.

The ultimate sag of a rope on the trailing side is generally reckoned at one-tenth the distance between centres, but extra is allowed upon this when estimating for clearance at the bottom of a drive.

MACHINE SHOP METHODS AND DEVICES

Unique Ways of Doing Things in the Machine Shop. Readers' Opinions Concerning Shop Practice. Data for Machinists. Contributions paid for.

A PLANER JOB.

By Mac K.

The press frame shown in the line cut fig. 1 is a steel casting 7' 3" high weighing approximately 4 tons. It was planed on a 6' x 6' x 12' planer.

The extension used shown in Fig. 2 is

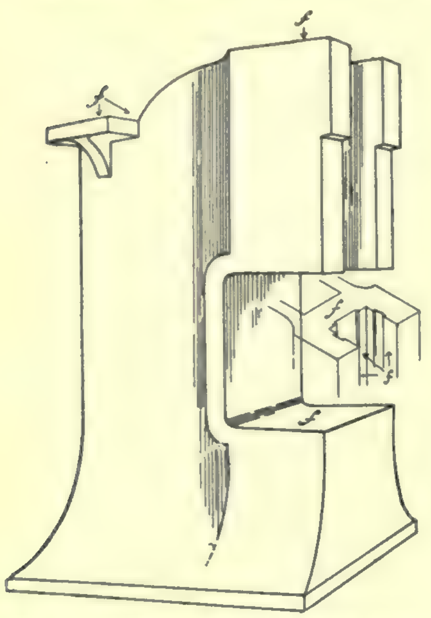


Fig. 1.—Drill Press Showing Finished Faces.

of cast iron 1¼" thick, planed on both faces and drilled to bolt on the cross rail using the four bolts that clamp the swiveling head.

The holes for the head were drilled 16" higher up in the extension plate. The two ¾" set screws were put in to take up any spring of the extension. The press frame was set up vertically

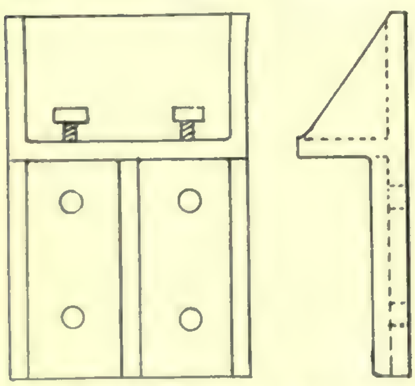


Fig. 2.—Plate Attached for High Work.

or on its own base on the planer, and finished on the faces besides the front and underside of projection. Using the finished faces on the top of the press square up by, when in a horizontal position the planing of the front faces was straight work.

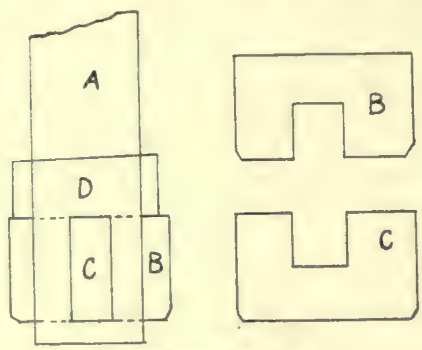
PIPE TAP AND DRILL.

By W. Richmond.

The accompanying drawings show a simple and cheap way to make a pipe tap and drill, which I have found very useful. The same idea can be used in a boring bar.

The holder A (Fig. 1) is made of ordinary tool steel with a shank to fit into the machine it is to be used on, the tapping end to be turned at least ¼-in. less than size of finished hole. Cut out two slots ¼-in. from end, at right angles to each other, a close fit, for cutters.

I use ⅜x1-in. high speed steel for taps for 1¼-in. up to 2-in, pipe. Make



Pipe Tap and Die.

one slot a little more than 1½ times the width of cutter, and 1-16-in. wider at one end, The cutters are cut out in the centre, as shown in Fig. 2, so that one will fit over the other.

On account of one slot being half as wide again as the other the cutters are very easily put in place, then drive in key, D, and they are ready to turn or thread, as desired.

CROSS HEAD REPAIR.

The high pressure side of a 300 h.p. cross compound tandem engine went through herself one morning shortly after starting. When the wreckage was cleared away, the frame, cylinder and crosshead on that side was all that was usable. After repairs and new parts were made and when the engine was being assembled, the crosshead, a steel casting was found to be cracked through at A, Fig. 1, and partly through at B. This was at 10 a.m. on Saturday, and the engine was billed to run at 6.45, Monday a.m.

To cast and machine a new one meant a week's delay, so the old one was repaired in the following manner: The crosshead was put on a taper mandrel and turned and threaded at C, 5

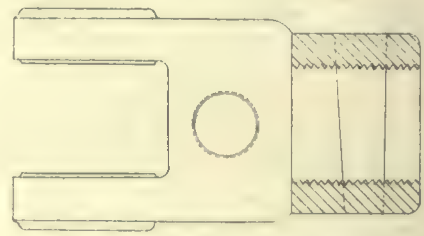


Fig. 1.—Completed Repair.

in. diam. x 5½ in. long, 8 threads per inch.

A mild steel collar 7 in. diam. x 5½ in. long was bored and threaded a very tight fit for the hub C. It could not be put on more than 1½ in. using a chain wrench with a 4 ft. handle. The crosshead was then returned to the lathe and the first 2½ in. of the thread on the hub C widened on top but not cut any deeper. The taper mandrel the crosshead was machined on, was marked and taken out and the crosshead bolted securely to the platen of a large planer, with the threaded hub C upped and the collar polished. The taper

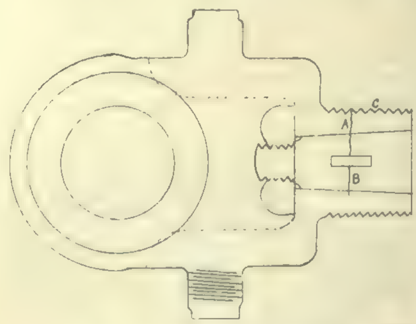


Fig. 2.—Broken Crosshead.

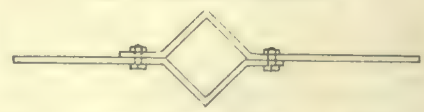


Fig. 3.—Clamp Used to Screw on Collar.

mandrel could not be driven in within 5-16 in. of its former distance.

To make sure a new piston rod was

gotten out that extended through the crosshead 1½ in. and threaded and after the piston rod and crosshead were coupled up a 1½ in. nut was driven in solid. The engine ran under full load Monday a.m., and is running yet with the temporary repair in place.

PUNCH AND DIE.

By W. J. T., Toronto.

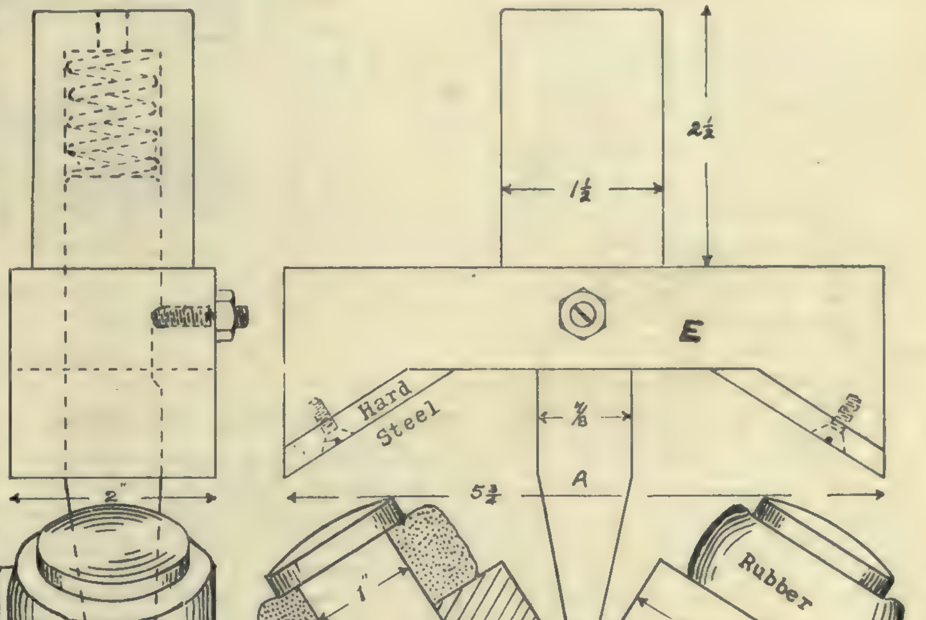
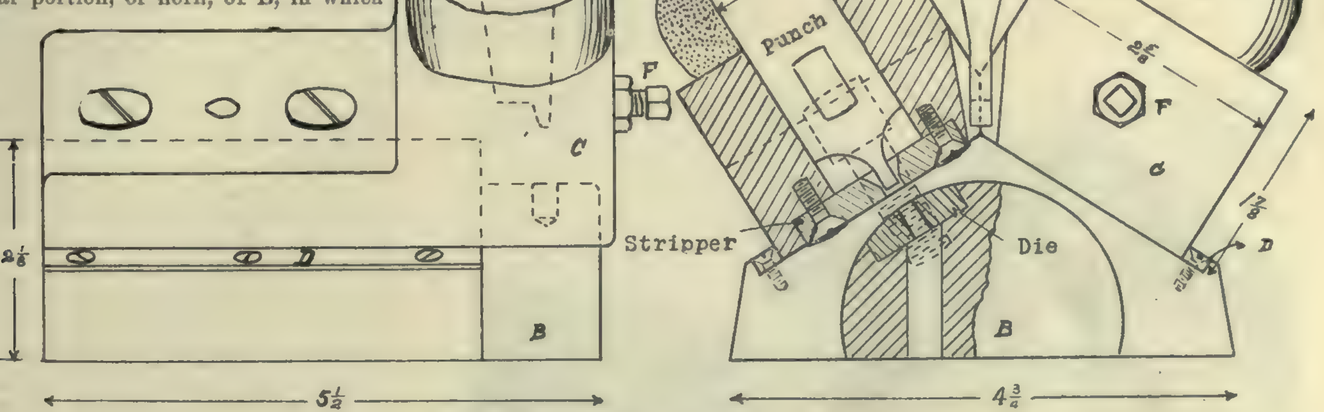
The sketch shown is of a tool made some weeks ago, for punching in one operation, two holes at an angle of about 60 deg., to each other in strips of steel bent in a semi-circle. These pieces are about 1-16-in. thick, by ⅜-in. wide, and are used for supporting the rear mud-guards of bicycles.

Block B is made of machinery steel, planed with two inclined surfaces on top, as shown, having two punch guides, C, screwed, and dowelled to those surfaces. On each side are screwed two strips, D; these are fitted last thing to insure a positive location after the correct position of the guides are found.

The sectional view shows the way the punches are held; rubber washers forcing them out of the work when the ram goes up; while the set-screws, F, prevents them from going up too far, as they lock against the bottom of the flat groove on the punch.

Only one of the two dies are shown; they being driven tightly into the semi-circular portion, or horn, of B, in which clearance holes in line with the dies are drilled.

The action of the die should be clear from the sketch. The spring finger A strikes the work first, holds it down, and crowds it back in position, until the punches are forced through by the incline faces of E. As the sketch is intended to convey the principle only, detail dimensions are not given.

Punch and Die for Bicycle Mud Gear Supports.

DRILLING HOLES ACCURATELY.

By S. A. Francis.

A method I have used for drilling holes accurately through the centre of round or square stock at right angles to the axis which has given very satisfactory results in actual practice and is simple in procedure, may be new and useful to some of your readers.

The common method pursued in a good many shops is to hold the work in the chuck or centres of the milling machine and adjust the height of the table when the drill or reamer is revolving in the spindle chuck until it just clears the top of the work, and then raising the table by means of the index screw a distance equal to half of the diameter of the work plus half of that tool in order to afford centre height. This method accomplishes the purpose satisfactorily but without knowing the pitch accuracy of the screw, and exact diameter of the work and tool, aside from the fact that drill must be running perfectly true, trouble will be experienced with it in obtaining accurate results.

A simpler method is to hold the work in the chuck or centres and cover both top and bottom of the work with a coat of chalk or other marking substance capable of being easily rubbed off, holding the drill in the spindle as is customary. Then raise the knee as is done in the other method, exercising care in the operation, to a point that when the table is moved back and forth, the revolving tool just rubs off the marking material. Replace the marking and adjust the height of the table, repeating the operation several times to obtain the exact lowest position in which the tool and the work are in contact, and set the screw index to zero.

Now run the work back clear of the tool and raise it a distance equal to approximately the diameter of the work plus that of the tool, repeating the operation on the underside of the work, adjusting the height as before until the highest position is found in which the marking is removed, being careful, of course, to keep the screw moving in the same direction all the time so as to avoid any back-lash. Then take the reading for the second setting and lower the table, adjusting the height to exactly half the distance shown between the two settings, all the time being careful to advance the screw in the same direction. The machine is now correctly set and the holes can be started with a short stiff centre reamer or drill with a find point.

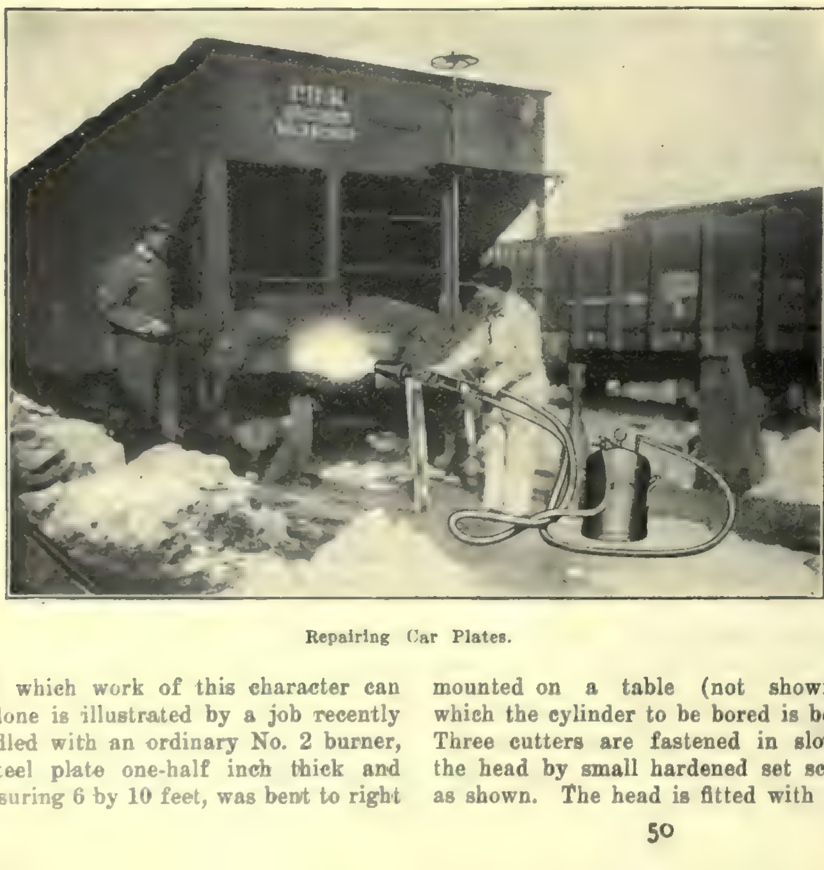
The method is performed a great deal easier than it is to describe it and in practice gives exceedingly close results.

REPAIRING CAR PLATES IN POSITION.

The rapidity with which the steel car is supplanting the old wooden type has been due in considerable degree to the opportunity afforded by the former for the making of repairs with greater ease and economy. A large part of this work consists merely in straightening out bent and battered plates and can be done in place, without the additional cost of removing the injured section; for such purposes as this portable tools have been particularly designed and have found wide favor.

In the March issue of Canadian Machinery it was shown that oil burners, being entirely portable and self-contained, can be used in any position. The one illustrated herewith was built by the Hauck Mfg. Co., Brooklyn, N. Y. It has been brought out especially for use in building and repairing steel cars, repairing engine frames, expanding tires and discs, boiler making, pipe bending and similar work common in the railroad, boiler and machine shop.

The illustration shows a burner in operation on car repair work. Aside from the powerful and even character of the flame, an important feature is found in the fact that it can be regulated either to heat a large surface or concentrated on a small area. The rapidity



Repairing Car Plates.

with which work of this character can be done is illustrated by a job recently handled with an ordinary No. 2 burner, a steel plate one-half inch thick and measuring 6 by 10 feet, was bent to right angles the longer way in 15 minutes, a space 8 inches wide by 10 feet long being heated for this purpose. The burner is also adapted for brazing and welding work.

Fig. 1.

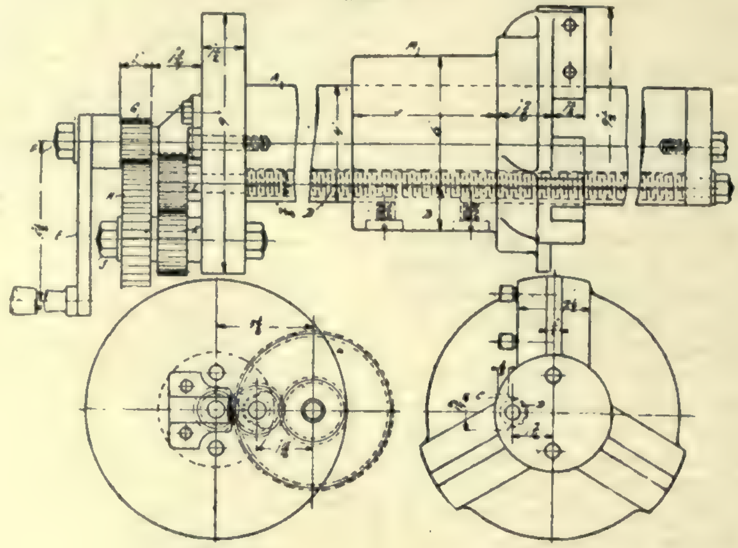


Fig. 2. Fig. 3.

Boring Bar for Cylinder.

BORING BAR FOR CYLINDERS.

The accompanying sketches illustrate the arangement of a bar and cutter head suitable for borning cylinders from 10 in. up to say 30 in. Fig. 1 is a front elevation, and Figs. 2 and 3 end views, of the gearing and cutter head respectively. Referring to the drawings, the bar A is carried by heavy bearings mounted on a table (not shown) to which the cylinder to be bored is bolted. Three cutters are fastened in slots in the head by small hardened set screws, as shown. The head is fitted with a die B which slides in the slot C and prevents the head from turning on the bar. The end of the die is threaded to suit the square-threaded feed screw D, from which it receives motion in a direction parallel to the axis of the bar. For quick adjustment the handle, which is free to revolve on the stud F, is turned by hand. The rotary motion is transmitted from the pinion G, which is fixed to the handle, to the wheel H, which is carried on the stud J, and is fixed to the pinion K, which gears with the pinion L keyed on the end of the feed screw D. The bar is rotated by a suitably driven worm gearing with a worm wheel keyed on the bar. The worm wheel is fixed close up against one of the bearings, on the other side of which is fixed a loose collar to prevent end play. When using the feed for cutting, a weight is hung on the handle. Then, as the pinion G is now fixed, the wheel H will be caused to revolve at a speed different from that of the bar, which through the medium of the pinions K and L, and the screw D, will move the head along the bar. Suitable wheels for a bar of this size will be about 3/8 in. pitch and 1 in. face. If pinion G has 11 teeth; wheel H 45 teeth; pinion K 18 teeth; and pinion L 14 teeth, and the screw is 1/4 in. pitch, the feed will work out at about 1-16 in. For boring cylinders larger in diameter than 12 in. different size heads are provided which fit the parallel part M of the head shown on the drawing, on which they are keyed. —Mechanical World.

Dr. Milton L. Hersey, of Montreal, has returned from Germany, where he went in connection with the sampling of Crown Reserve ore purchased by the German Government.

CANADIAN MACHINERY AND MANUFACTURING NEWS

A monthly newspaper devoted to machinery and manufacturing interests mechanical and electrical trades, the foundry, technical progress, construction and improvement, and to all users of power developed from steam, gas, electricity, compressed air and water in Canada.

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Vol. V. JUNE, 1909 No. 6

SUGGESTIONS FOR IMPROVEMENTS.

There are several ways in which great economies may be effected in machine departments. In the G.T.R. shops at Stratford it is the duty of one mechanic to inspect the machine equipment and suggest improvements. In the Alymer Pump & Scales Co. a prize of $100 was set apart for suggestions, and while it met with a certain response on the part of the men, was not as successful as might have been expected.

Many improvements in machinery are directly due to ideas of men in the shops and more should be done to encourage them in thinking out ideas for labor and time saving. In the works of Somerville, Ltd., the superintendent has instituted a scheme which he has found to bring good results. A notice was posted where all the men could read it as follows :

Complaints or Sugestions.

A prize of $1.00 is offered for any suggestion which, by its adoption, will show a saving in money or time. Box opened 1st and 15th of each month.

Quarterly Prizes.

March, June, September and December, according to value for the best three suggestions adopted.

By this method the reward is not too great and the men are encouraged to send in ideas for saving in the little things and the results are gratifying.

The Toronto Railway Co. welcomes ideas from their men and the coupling for trailers is the suggestion of a motorman who was rewarded handsomely. Previous to the adoption of the device now in use repairs caused by the jerking of the trailer amounted to several hundred dollars per month while now the repairs from the same source is less than one-sixteenth. It will be of advantage to both manufacturer and workmen to encourage the co-operation of the workmen in securing improved methods of manufacturing or an improvement in the design of the manufactured product

TOPICS FOR THE MONTH.

Nickel steel will be used in the construction of the new Quebec bridge. This has a greater strength than the carbon steel used in the first structure. The new bridge will have a span almost as great as the 1,800-foot span of the first bridge. This means that the present piers, which cost a million and a half dollars, will be made use of. The carrying capacity will be considerably greater than was designed for the first. The new bridge will carry any load that can be transported over 80-pound rails. The height of the bridge has been definitely fixed at 150 feet above water at high tide.

* * *

Trade returns of the Dominion for April, the first month of the fiscal year, shows a steady improvement. The total trade for April amounted to $34,998,854, an increase of $4,028,267 over the same month in 1908. Imports for the month totalled $22,531,673 an increase of $2,609,078. Exports amounted to $11,862,797, an improvement of $1,567,969. The customs duty collected amounted to $3,788,480, an increase of $490,739.

* * *

Dr. Milton L. Hersey, M.Sc., has donated $10,000 to the Metallurgical Department of McGill University. The revenue from this sum is to be applied to the purchase of special apparatus for research work. It will be remembered that Dr. Hersey recently gave a similar amount to the School of Mining, Kingston. His example might well be followed by a few others.

* * *

The Foundrymen's Convention held in Cincinnati May 17-22 was a big success. The papers were of great interest and a number of them will be reprinted in Canadian Machinery. The exhibition of foundry equipment was very complete. The report of the convention in this issue will give the reader an idea of the exhibits of machinery for increasing the efficiency of the foundry. A study of the apparatus shown is an education in itself and every foundryman who did not attend, missed an opportunity of gaining some valuable knowledge. Ho, for Detroit, 1910 !

* * *

As an instance of development in Western Canada, it is estimated that $85,000,000 will be spent in construction work alone during the present year. The work under construction by the C.P.R. will be $20,000,000, Great Northern $15,000,000, C.N.R. $11,000,000 and the G.T.P. $11,000,000. The industrial life of Canada is steadily forging forward and the railways are only keeping pace with the development of the country. The twentieth century is the century of Canada.

FOUNDRY PRACTICE AND EQUIPMENT

Practical Articles for Canadian Foundrymen and Pattern Makers, and News of Foundrymen's and Allied Associations. Contributions Invited.

Convention of American Foundrymen's Association

Report of Gathering in Cincinnati---The Programmes and Papers---Arthur T. Waterfall, Detroit, President for Coming Year---Convention in Detroit, June, 1910.

Another convention has passed into the records of the American Foundrymen's Association, a convention which clearly demonstrated the interest in foundry affairs taken by all concerned. The scene of the exhibits and meetings was the Music Hall, Elm Street, Cincinnati, where the main floor of the south wing was devoted to exhibitors' booths. In the rear of the building was erected a temporary structure devoted to those exhibiting operating furnaces, torches, etc.

Although the convention was not officially opened until Tuesday, Monday May 17th, found a large percentage of the out of town visitors on hand. Exhibitors used this day in putting the final touches to their exhibits and "getting settled."

As was the case last year, the four associations, the American Foundrymen's Association, the American Brass Founders' Association and the Foundry and Manufacturers' Supply Association were all concerned in this convention.

L. L. ANTHES
Past President.

Each association held its own meetings and there were the regular educational meetings of the A.F.A. and the A.B.F.A. at which papers were read and discussed. The effect of these papers lies not so much in their actual reading as in the discussion invoked. Each one

ARTHUR T. WATERFALL.
New President A. F. A.

of those in attendance has at least one or two points of interest of which he could speak, but is held back by thinking that everyone present knows these self-same points as well as he and so is reticent about speaking. Hence the value of the discussions which lead to questions being asked and answered and more knowledge gathered of this important factor in manufacturing. So let us have lots and lots of discussion and then some.

Opening Session Tuesday Afternoon.

The sessions of the A.F.A. were held in the Music Hall and were all well attended. The discussions attending the reading of the papers were entered into with an increasing amount of interest. This fact was clearly demonstrated at this convention by the large attendance and number of speakers.

The President's Address.

After one or two introductory opening speeches of welcome, Mr. Anthes delivered his presidential address. In opening he touched upon the growth of the association, bringing attention to the different allied bodies which have evolved from the original organization made necessary by the growth and specialization of the various branches of the foundry business and mentioned that the steel interests are now inclined to form an additional section. He urged the necessity of harmony and broadmindedness among the associations that good results already obtained should be multiplied and not retarded. "We have struck the right key note, let us keep in tune."

Attention was called to the necessity of a deeper knowledge—a more comprehensive grasp of the laws of nature which bear upon industrial development. For this reason he was in favor of the increase in the annual fee from five to ten dollars because experiments cannot be conducted with an empty treasury and it was for the purpose of conducting experiments to solve difficulties for foundrymen that the American Foundrymen's Association was created. "The A.F.A. is the hub of foundry progress and we surely will not stop the band wagon because we are stingy with the axle greese."

An important move, he said, was under consideration which would prove

WM. R. WEBSTER.
New President A. B. F. A.

of inestimable value to the metal industries. This is the establishment of

an endowed laboratory and bureau of standardization for these branches of our industrial institutions. Many discoveries important to the trade, are no doubt lost because of the inability of the discoverer to continue experiments and investigations owing to lack of funds and facilities, whereas if a central bureau were established where reports could be made to practical men, the necessary attention could be given and in many cases beneficial results would accrue.

The necessity of imparting up to date practical knowledge in technical schools was touched upon and a suggestion made that the text books be compiled by a central bureau (as the one mentioned above) manned by men qualified to conduct experiments and compile these text books ensuing the students receiving a training in accordance with up-to-date foundry practice.

The development in foundry work attendant upon the introduction of the molding machine was touched upon, the importance of this innovation to the foundry trade, and the bearing it has on the development of foundry business. Now the important question is, "What is the most economical and efficient method to handle the molds that are turned out by the molding machines?" To answer this question the association had endeavored to secure as many papers as possible on this subject so that educational discussions would ensue.

Other Addresses and Reports.

In the absence of President Caley of the American Brass Founders' Association, Wm. R. Webster, vice-president, read his address. This constituted a brief review of the progress of this section and an outline of the future policy to be pursued.

Following this the reports of the secretary and treasurer of the A.B.F.A. were read, after which Dr. Moldenke read his report as secretary of the A. F.A. He informed the meeting that he is conducting a series of experiments that, if successful, will eliminate the use of flour in foundry work. He also gave the result of the letter ballot on the question regarding the raising of the annual fee. Out of 724 members qualified to vote only 187 answered, 143 being for the increase and 44 against, this majority not being large enough the fee still stands at five dollars. The condition of the association's finances was touched upon and the necessity of a higher fee pointed out.

The reading of the report of the committee on standard specifications for foundry iron was postponed and then followed the report of the committee on prevention of accidents in foundries, which was read by T. D. West, chairman. The session closed with the reception of reports of the other various committees of the A. B. F. A.

Tuesday Evening.

Cincinnati tendered a civic reception in the Hotel Sinton, for the visiting associations. This was largely attended and was the "get together" meeting of the convention, and was thorougaly enjoyed by everyone. It was estimated that about 2,000 took advantage of the event, the chief features of which was a dance in one of the large halls. A buffet luncheon was served throughout the affair.

Dr. Moldenke Welcoming the Foundrymen.

Wednesday Morning.

This session was devoted to papers of both the A.B.F.A. and A.F.A. A paper on "The Manufacture of Red Brass Ingot ; its uses and Advantages," by W. M. Corse, Detroit, Mich., was read. The purpose of the paper was to give an account of the manufacture of high grade ingot brass, so that the foundry man may understand why it is now extensively used in castings in which the use of the ingot was not allowed a few years ago. The six principal points of advantage in using ingot brass was summarized as follows : uniform composition, low shrinkage in melting, decreased cost in handling, exact amount of impurities known, value received for the price paid, saving in first cost over new metals.

In a paper on "Waste Heat," by F. W. Reidenbach, general manager Genesee Metal Co., Rochester, N.Y., the following pointed questions were asked :

"Do we as foundrymen get all the value from the combustible materials we use in melting the various metals ? Or do we just melt metals ? It seems to me we ought to utilize this waste heat to good advantage. Open-hearth steel mills, by the use of waste heat units, generate steam sufficient to operate large plants. Why not brass foundries ? Construction of plant, would, perhaps, be the first consideration. A plant would have to be constructed upon lines whereby all of the valuable points appertaining to the use of the waste heat could come in for consideration. I would suggest a core-oven as one important factor; a suitable rack for skin-drying molds would be another; or, like the steel mills, a stream sufficient to operate a tumbling barrel, a sprue-cutter, a saw or emery wheels ; or one may at least use the heat for producing hot water. That would add to the comforts of the help in washing up for supper after their daily toil."

In a paper on "The Cost of Steel Melting in Foundries by Dr. Bradley Stoughton, New York, he said that wherever the electric process has come into use it has supplanted the crucible process. One of the important considerations in this connection is the cost of instalation which is at least 10 times that of the crucible process. The electric process, he said, has the advantage in that the cheapest form of scrap available in the market can be used while it turns out a very high grade finished product.

"The electric process can hardly hope to compete in the cost of production with any of the prevailing processes except the crucible process, and then only when electric power is available at three cents per kilowatt-hour or less. It may well be, however, that recent developments in the electric process will bring its cost down to the point where the converter process will be superceded to some extent, especially in view of the very high quality of electric steel. This suggestion, however, is not to be taken in any sense as a prophecy. The costs of the electric process available only for large tonnages is materially lower than those given above, but the cost of instalation of this type of electric furnace is so

large that many immediate replacements are not probable."

Other papers of the morning session included "Open Hearth Methods for

F. N. PERKINS.

President Foundry and Manufacturers' Supply Association.

Steel Castings," by W. M. Case; "Notes on Air Furnace Construction for Malleable Castings," by W. H. Kane; "The Use of Pulverized Coal for Foundry Purposes," by R. K. Meade.

Wednesday Afternoon.

The value of some of the papers to be read at this session was marred by the interference of the Cincinnati Fire Prevention Bureau. The inspector forbade the showing of the lantern slides and moving pictures until a standard cabinet to inclose a standard moving picture machine could be procured. By the time the matter had been settled to the inspector's satisfaction it was too late to use the machine.

However those whose papers needed the illustrations got on as best they could. The papers included one on: "Continuous Melting in the Foundry of the Westinghouse Air Brake Co.," by S. D. Sleeth, Wilmerding, Pa. He said:

"When we started work in the new foundry at Wilmerding, we ran two cupolas, one in the morning and one in the afternoon. We were afraid to hold over dinner hour. After running for some time in this way we decided to run one cupola all day; at 11 o'clock, or a little later, we added 200 lbs. of coke for two or three charges so that we would have an extra amount of coke to hold over the dinner hour. Our great trouble at this time was with the cupola man, as he insisted that the iron would freeze at the tapping hole, but we finally persuaded him that he would not be held responsible should this occur. We drained all the iron out at 12 o'clock and closed the slag hole with sand, stopping the tapping hole, and shutting all other openings tight, so there would be no draught. About ten minutes before starting time we tapped out all that was in the cupola and pigged it, then put the blast on full, so as to be ready when the starting whistle blew. Sometimes we have to pig two or three hundred pounds on account of the metal not being hot enough.

"We had two sizes of cupola—48 inch and 60 inch inside the lining. When the heats were heavy we would run the 60 inch. We had to enlarge the plant again so we took out the 48 inch cupola and installed two new cupolas, the shells being 90 inch, so that we could line them up to 78 inch if re-

F. N. PERKINS

President Foundry Supply Association.

quired. We have them lined at the present time to 70 inch. When running full, i.e., night and day, we melt 280 tons, running each cupola about ten hours. We have operated one cupola from Friday night at 6 o'clock until Saturday noon of the following day, closing down at 11 p.m. for one-half hour for lunch, and again at 6.30 in the morning for three-quarters of an hour for breakfast. This is rather hard on the lining so we do not make a practice of it. We have tried a great many experiments with cupolas, but as yet have been unable to find any that will give better results than the double row of tuyeres—the upper row about 10 inches above the lower. It is not necessary to keep the upper ones open all the time. Our blast pressure is about 11 ounces in the cupola bustle. We use a fan for blast. When running full we melt ten to eleven pounds of iron to one pound of coke."

The paper by Edgar A. Custer on "The Permanent Mold," was to have been illustrated by moving pictures but, owing to the misunderstanding mentioned, this was not possible. Other papers were "Cores and Core Making," by F. K. Cheney; "Continuous Melting," by R. H. Probert; "The Practical Value of Chemical Standards for Iron Castings," by Dr. J. J. Parker.

In the latter paper attention is drawn to the importance of understanding mixing by analysis and the meeting was urged to take under consideration the advisability of appointing a committee for the formation of chemical standards for iron castings.

Evidently, then, the most feasible way of placing this metallurgical data before the foundryman in such form as to make it of practical value, is to first classify castings according to the physical properties which are of importance in them, and then to tabulate the chemical compositions which are found suitable for each class. It would also be highly desirable to take some cognizance of the factor of the cost of the mixture and show, where possible, how the foundryman could cut down the cost of his iron without decreasing the quality of his product.

An investigation carried out along these lines, while involving considerable work, would not be impossible and would certainly be of immediate and direct benefit to the foundry industry. The data needed could be obtained very largely from material already published

EUGENE W. SMITH.

President Associated Foundry Foremen.

and from inquiry among plants making the various lines of castings. Some experimental work would undoubtedly be needed to fill in the gaps, but I do not

believe that it would be very great in amount.

New Officers of A.B.F.A.

The president for the coming year is W. R. Webster, Bridgeport, Conn.; the vice-presidents are Edward O. Goss, Waterbury, Conn.; L. W. Olsen, Mansfield, Ohio; W. L. Abate, New York; Thomas Evans, Philadelphia, Pa.; J. N. Gamble, Kewanee, Ill.; W. D. Allen, Chicago; J. C. Sharp, Chattanooga, Tenn.; N. K. B. Patch, Toronto; Richard R. Mitchell, Montreal. The secretary-treasurer will be W. M. Cosse, Detroit, Mich.

New Officers of A.F.F.

The men who will hold the reins of the Associated Foundry Foremen were elected as follows: President, E. H. Smith, Chicago; first vice-president, W. F. Grunan, Erie, Pa.; second vice-president, I. C. Marshall, Milwaukee; secretary-treasurer, C. E. Hoyt, Chicago.

Thursday Morning.

The weather man must have overslept this morning as rain started early and continued all day. The morning was devoted to papers of both the . B. F. A. and A.F.A.

Thursday Afternoon.

Notwithstanding the continuous downpour about 2,000 of the visitors and their friends took advantage of the outing provided by the entertainment committee. They gathered at the Sinton and left on the Steamer Island Queen for a trip on the Ohio river. The excursionists were first given a view of the lower river as far as Anderson's Ferry. Then turning round the trip was made to Coney Island.

In the pouting rain the delegates and their ladies, headed by Smitties' band, marched up to the shelter house where refreshments in the form of "Kentucky's celebrated burgoo" was served. The city was reached on the home trip about 10 p. m. a buffet luncheon being served on the boat.

Friday Morning.

The morning session which was the last of the A.F.A. meetings was devoted to a discussion on the adoption of the report of the committee on standard specifications for foundry iron; the acceptance of Detroit for next year's convention an the election of officers. Those papers which had not already been taken up were read by titles only.

The report of the nominating committee was adopted and the following officers were elected: President, Arthur T. Waterfall, Russell Wheel and Foundry Co., Detroit; secretary-treasurer, Richard Moldenke, Watchung, N.J.; the vice-presidents are F. B. Farnsworth, McLagen Foundry Co., New Haven, Conn.; Walter Wood, R. D. Wood & Co., Philadelphia; J. T. Speer, Pittsburg Valve, Foundry and Construction Co., Pittsburg; E. W. Smith, Crane Co., Chicago; J. W. Sherrif, Sherrifs Mfg. Co., Milwaukee; A. E. Howell, Phillips and Buttorf Mfg. Co., Nashville, Tenn.; Wm. Gilbert, Buckeye Foundry Co., Cincinnati; A. N. W. Clare, Clare Stove Co., Preston, Ont.; L. L. Anthes was elected an honorary member.

F. & M. S. A. Meeting.

The annual meeting of this association was held in the Hotel Sinton on Friday night. It was decided that no souvenirs were to be given away at the next convention. If any firm desired to have souvenirs they were to be mailed to them later. Discussions as to delinquent members took place and reports of officers read.

H. M. Lane Feeding the Elephant at the Cincinnati Zoo.

The officers for the ensuing year were elected as follows:

President, F. N. Perkins, Arcade Manufacturing Co., Freeport, Ill.; vice-presidents, F. B. Stevens, Detroit; R. S. Buch, Philadelphia; S. T. Johnson, Chicago; Wm. Lodge, Cincinnati; secretary, C. E. Hoyt, Chicago; treasurer, J. S. McCormick, Pittsburg; trustees for three years, E. A. Pridmore, Chicago; Geo. Wadsworth, Cuyahoga Falls; H. R. Atwood, Cleveland; E. J. Woodison, Detroit.

Notes of the Convention.

Detroit next year!

Let every Canadian foundryman be on hand who can possibly get away.

"Rest thy weary bones" looked very inviting, backed up as it was by E. J. W.'s welcoming smile.

Did you get a pyrometer?

That "make-a-noise-like-an-order" stunt was good—and very much in evidence (everywhere) as was the "bubble novelty" from the same booth.

The Ontario Wind Engine and Pump Co., Toronto, took advantage of the convention to add to their already strong foundry line the lines of the Calumet Engineering Co., Harvey, Ill., consisting of cranes, ladles, cupolas and other foundry equipment. They will also handle for Canada, the Acme parting and red facing of the Central Foundry Supply Co., Columbus, Ohio. Edmund Stanley will have charge of the foundry supply and equipment department.

The S. Obermayer Company's Convention Guide was very opportune. Besides giving a list of Cincinnati hotels with their rates, it pointed out the various points of interest to sightseers and gave directions how to reach them. The illustrations of the Obermayer Maid and some of the company's supply lines were good and the titles reflected the company's usual snappy style.

It was too bad the convention group photo was not taken earlier in the week. Many were at the convention who had left before Saturday morning.

One of our esteemed contemporaries had a placard on their exhibit giving their circulation last month as ten decimal nought three two. Nuff sed.

The Canadians present included the following list which is not altogether complete owing to the fact that many did not register. The list is:

L. L. Anthes, Toronto Foundry Co., Toronto, Ont.; Miss Anthes, Toronto; Miss Libbie Anthes, Toronto; Geo. A. Armstrong, McKinnon Dash & Machine Works Co., St. Catharines; T. Ben. Bennett, D. Maxwell & Sons, St. Marys, Ont.; Solomon Barnes, Warden King, Limited, Montreal, Que.; T. J. Best, Warden King, Limited, Montreal, Que.; Mrs. T. Ben. Bennett, St. Marys, Ont.; J. A. Crossman, Amherst Foundry Co., Amherst, N.S.; A. N. W. Clare, Clare Bros. & Co., Ltd., Preston, Ont.; S. H. Chapman, Ontario Wind Engine & Pump Co., Toronto; John J. Cunningham, Western Foundry Co., Wingham, Ont.; John Douglas, Gurney Foundry Co., 38 Fuller St., Toronto, Ont.; J. H. Fryer, Galt Malleable Iron Co., Limited, Galt, Ont.; Mrs. J. H. Fryer, Galt, Ont.; Horatio Gooder, John Inglis Co., Ltd., 161 Lansdowne Ave., Toronto, Ont.; Frank Hughes, International Harvester Co., Hamilton, Ont.; A. R. Hockin, Taylor Forbes Co., Guelph, Ont.; Mrs. J. P. Hockin, Taylor Forbes Co., Guelph, Ont.; J. P. Hockin, Taylor Forbes Co., Guelph, Ont.; W. F. King, F. Hyde & Co., Montreal; W. J. Kevy, F. Hyde & Co., Montreal; F. W. King, McClary Mfg. Co., London, Ont.; James E. Long, McKinnon Dash & Metal Co., St. Cath-

arines, Ont.; J. R. Meadowcroft, The Garth Co., 28 Craig, West Montrose; Mrs. J. R. Meadowcroft; R. R. Mitchell, The Robt. Mitchell Co., Ltd., Montreal; W. K. B. Patch, Lumen Bearing Co., Toronto, Ont.; A. J. Palmer, Emp re Mfg. Co., London, Ont.; N. K. Reid, Reid & Brown, Toronto, Ont.; C. Rehder, Bowmanville Foundry Co., Bowmanville, Ont.; Geo. D. Smith, Montreal Steel Works Co., Montreal; Edmund Stanley, Ontario Wind Engine & Pump Co., 504 Spadina Ave., Toronto; W. W. Taylor, Jas. S. Taylor, John M. Taylor, jr., Taylor-Forbes Co., Ltd., Guelph, Ont.; Robt. B. Thomson, Buffalo Pitts Co., Buffalo; Samuel Terrell, Raymond Mfg. Co., Guelph, Ont.; H. V. Tyrrell, Canadian Machinery, Toronto; William B. Thomson, Brockville, Ont.; Douglas Wilkes, Canadian Machinery, Montreal; Fred Washburn, Taylor-Forbes, Guelph, Ont.; Geo. H. Weaver, Dominion Foundry Supply Co., Montreal ;F . S. Campbell, Taylor Forbes Co., Guelph, Ont.

"With the excursionists came ingredients for 5,000 mint juleps, 200 quarts of good old mellow Bourbon and 1,000 siphons of seltzer, besides a large quantity of beer"—Daily paper. What do you know about that?

We will publish a photo of the souvenirs in our July issue.

The Exhibitors and Exhibits.

MONARCH ENGINEERING CO., BALTIMORE, MD., were showing two Steele-Harvey tilting furnaces of 170 and 375 pounds respectively; a non-tilting furnace of 170 pounds capacity, a five shelve Monarch core oven, a Monarch ladle heather, a Monarch blower and one skin drying burner. These were manufactured, shipped, set up and in operation in less than 10 days from the time the order went into the shop. Representing the company were H. D. Harvey and D. R. Steele.

W. W. SLY MANUFACTURING CO., CLEVELAND, OHIO, had an exhibit consisting of a series of photographs showing different installations made by them. They also showed a model of their cinder mill. The representatives of the company were W. W. Sly, W. C. Sly, H. R. Morse and D. A. Livensparger.

CANADIAN MACHINERY, TORONTO, CANADA, were represented by H. V. Tyrrell and F. C. D. Wilkes and made their booth the headquarters for the Canadians present.

E. H. MUMFORD CO., PHILADELPHIA, had a joint exhibit with Curtis Mfg. Co., St. Louis, showing the Curtis-Mumford Overhead Molder, which is a suspended mechanism by which large flasks jolt-rammed on an arcade jolt-ramming machine will be lifted and rolled by power and the patern drawn from the joint while the mold is suspended. They had also a new 10" high trunion power squeezer, and a standard power ramming split pattern vibrator machine on exhibition. Representing the company were E. H. Mumford and E. M. Zwing.

CURTIS MANUFACTURING CO., ST. LOUIS, MO., exhibited in conjunction with the E. H. Mumford Co., and besides the machines noted above they showed an air hoist, a small belt driven air compressor and a sand blast outfit. E. H. Steedman was the company's representative.

CARBORUNDUM CO., NIAGARA FALLS, N. Y., had an interesting exhibit. It consisted of samples of the finished product in almost every conceivable shape, wheels, rubbing bricks, abrasive paper, etc.; by-products such as silican and fine sand; also samples of carborundum in the different stages of manufacture. Visitors were presented with a stick pin of carborundum crystals. G. R. Rayner, W. W. Sanderson, H. A. Eaton, and R. B. Fuller represented the company.

The Music Hall, Cincinnati, where the Foundry Supply Exhibition was Held.

ARCADE MFG. CO., FREEPORT, ILL., exhibited the latest models of No. 1 and No. 2 Modern Molding Machines. These are equipped with pneumatic vibrators and automatic trip adjustments, which have a number of new features of great interest. There was also a demonstration of Buck's Roll-Up Device, which is achieving wonderful results in stove foundries. Perhaps the most interesting feature was the exhibit of the Norcross jolting machine which is designed to ram molds weighing up to 20,000 lbs. They also exhibited a large number of castings that are being made by prominent manufacturers in the U. S. and Canada. The representatives on hand were Chas. Morgan, Ed. Morgan, F. N. Perkins, W. C. Norcross, Henry Stcherning. The souvenirs of this exhibit were a small shovel and a paper weight, the shovel having a small tag attached to it.

CALUMET ENGINEERING WORKS, HARVEY, ILL., were on hand and were represented by O. G. Lewis, R. A. Dugan, J. T. Krieger, R. Scully. Their exhibit consisted of a model, in section, of a Calumet cupola showing its construction, and a standard 2-ton label. A patent air hoist valve was also shown.

CLEVELAND WIRE SPRING CO., CLEVELAND, OHIO, were ably represented by J. W. Campbell. They showed samples of steel shop barrels, kegs and handy trucks for moving them from place to place in the shop. The wire exhibit consisted of heavy and light coil wire springs for agriculture implements, machinery and automobiles; specialties in wire and cans for oily waste.

GOLDSCHMIDT-THERMIT CO., NEW YORK, were represented by A. M. Guenther. Their exhibit consisted of a display of welded pipes, motor casings and shafts; thermit cans for foundry purposes; crucibles and apparatus for welding purposes; rare metals free from carbon; demonstration of the thermit reaction, welding pipes and burning holes through one inch plates. The souvenir of this exhibit was a very handsome stick pin, emblematic of the thermit process, done in enamel and gold.

THE MILLERS PRODUCTS CO., CHICAGO, ILL., had samples of Black Diamond Core compound, foundry flours, etc. The souvenirs consisted of a wooden rattle which bore the pointed exhortation to "Make a noise like an order," and a mechanical bubble novelty. Representing the company were C. B. Spaulding, N. T. McGrath, S. H. Baird, Jas. Harrison, Wm. J. Brant.

NEWPORT SAND BANK CO., NEWPORT, KY., were represented by J. Frank Dye and George Dye. Their exhibit consisted of a neat array of sand samples from their mines. Souvenirs of this booth were a paper weight and a cake of soap.

THE BUCKEY BELL FOUNDRY CO., also had space in this booth with an exhibition of various bell castings.

S. OBERMAYER CO., CINCINNATI, had an extensive exhibit consisting of 702 Ceylon plumbago, kantbebeat dry core compound, blue leather bellows, Rockwell riddles, National Island filler cement, core ovens, etc., making a showing of a full line of foundry supplies. The largest of their two booths was reserved as a resting place and plentifully supplied with comfortable chairs. They also had published a guide to the convention which was much appreciated. Representing the company were H. F. Frohman, E. D. Frohman, S. T. Johnson and a number of others.

J. A. FAY & EGAN CO., CINCINNATI, had an exhibit of their well known wood working machinery consisting of a No. 50 36 inch band saw, a No. 156—24" surfacer, a No. 195—20 inch hand planer with draft attachment, and a No. 205 double circular rip and cut off saws. The band mill is made with a straight column instead of the old style goose neck and has a solid lower wheel which permits of running at a very high speed. A feature of the surfacer is the new style clamp boxes which eliminate pouring of babbit. These boxes have an arrangement of plates with babbitted edges which are clamped in place. When it is necessary to take up wear these plates are loosened and gently tapped to take up new position and present a new bearing. In the circular saw outfit the saws are placed outside of the frame so that no dust gets into the working parts. The saws and table are fitted with micrometer adjustments. All machines are motor driven. Representing the company were C. P. Egan, Wm. Spencer, W. H. Koumer.

HENRY E. PRIDMORE, CHICAGO, ILL., exhibited a Pridmore power ramming rock-over drop molding machine in which both flasks are rammed with air cylinders. They also showed rock-over, drop, band rammed machines a stripping plate machine fitted up with a gear pattern. This is also a hand rammed machine. On hand to look after this booth were E. A. Pridmore, H. A. Pridmore, W. H. Phinney, W. W. Miller, R. E. Turnbull.

THE SAND MIXING MACHINE CO., NEW YORK, who were represented by V. E. Minich, had in operation one of their auto sand mixers. This machine runs over a long ridge of sand thoroughly mixing it. The power used is electricity. In Canada this machine is being made by N. D. Neil, Brantford.

THE DIAMOND CLAMP AND FLASK CO., RICHMOND, IND., showed the Diamond improved plunger type core machine, a Diamond automatic core machine, a core cutter, a core coner, snap flasks, a pattern maker's lathe chuck, etc. Representing company were W. N. Gartside, G. W. Phiel, T. Johnson. The souvenir from this booth was a match safe made of core sand.

J. D. SMITH FOUNDRY CO., CLEVELAND, OHIO, had their exhibit in the temporary building. Representing the firm were J. S. Smith, F. A. Coleman, M. S. Finley, Joseph Harris. The exhibit included a Cleveland tumbling barrel; a Cleveland sprue cutter; a rolling drawer core oven with overhead trolley for drawing the drawers eliminating all jar and thus reducing the breakage of cores; a complete brass furnace setting with an overhead crane for removing the crucibles, and a sand blast outfit.

HAUCK MANUFACTURING CO., BROOKLYN, N. Y., exhibited in the temporary building a line of portable burners of all kinds for foundry purposes, ladle heaters, etc. Demonstrations were carried on throughout the convention. A.

E. Hauck, A. P. Link, and A. H. Stein were the company's representatives.

THE STANDARD SAND AND MACHINE CO., CLEVELAND, were located in the temporary building and showed an operating 15 ton per hour machine for proportioning and treating all materials used in making up molds also for separating the iron from the Sand. They also showed portable power screens. Representing the company were H. G. Boughton, C. J. Morgan, W. H. Smith

JAMES B. WISE, WATERTOWN, N. Y., were represented by R. F. Govne who looked after the operation of a M.R.V. brass melting tilting furnace in the ttmporary building.

THE HERMAN PNEUMATIC MACHINE CO., ZELIENOPLE, PA., exhibited a large Herman jarring molding machine in their booth in the temporary building. Other features of their exhibit included smaller jarring molding machines. The company was represented by M. L. Heyl, J. J. Lawlor, C. E. Pettee.

ROCKWELL FURNACE CO., NEW YORK, who were represented by W. S. Quigley, A. L. Stevens, and W. H. Fitch, had space in the temporary building where they exhibited a No. 1 double chamber melting furnace ; a No. 10 tilting crucible furnace ; a No. 92 simplex furnace ; a lift out crucible furnace (pit or above-floor type) ; a soft metal melting furnace a hardening, tempering and annealing furnace ; two portable heaters for skin drying and heating crucibles one self contained, the other of the compressed air type. This firm also makes general furnaces and furnish them all the way from those used in tempering a watch spring to that used in tempering huge chunks of armour plate.

THE BROWNING ENGINEERING CO., CLEVELAND, OHIO, were represented by H. E. Green. They had no exhibit beyond a complete line of literature.

THE OLIVER MACHINERY CO., GRAND RAPIDS, MICH., represented by A. N. Spencer, J. P. Schmidt, W. Mentzer, had a very complete exhibit of their wood working machinery including a Wadkin Universal wood worker in operation and a direct connected motor driven speed lathe and a new bench trimmer which will work at any angle, acute and obtuse. A feature of the exhibit was a quick acting pattern maker's vise. They also showed samples of steel and wood clamps and other pattern making equipment.

OSBORN MANUFACTURING CO., CLEVELAND, OHIO, exhibited a hand and jolt rock over molding machine, molders brushes of all descriptions, riddles, etc. The souvenir of this booth was a shoe brush. Representing the company were H. R. Atwater, F. D. Jacobs, J. H. Galloway, C. D. Eadie.

THE FALLS RIVET AND MACHINE CO., CUYAHOGA FALLS, OHIO, exhibited a line of core making equipment consisting of one sand mixer and compounder ; three standard core making machines Nos. 1, 2 and 3 ; one core cutting off and coning machine ; a core oven ; standard core paints and cabinets ; section of steel shelving for receiving stock cores after manufactured. The machines were all in operation and were run by a 3½ h.p. motor. Geo. H. Wadsworth was in charge of the exhibit and had with him John Reese and Chester Cox.

A. BUCKS & SONS, Co., ELIZABETHTOWN, PA., occupied a large booth in the center aisle where they operated one of their gravity molding machines. The exhibit created a good deal of interest and called forth many complimentary remarks regarding the efficiency of the machine. The machine elevates the sand and drops it into the flask from a height of about 12 feet filling and ramming the flask at the same time. They also had a jar and squeeze molding machine in operation. Other exhibits included snap taper flasks, large and small. Representing the company were R. S. Buck, C. A. West and P. J. Parker, while F. H. Chapman and E. Stanley were present for the Ontario Wind Engine and Pump Co., Toronto, the Canadian agents for these machines.

HOLLAND LINSEED OIL CO., CHICAGO, were represented by P. M. Baumgardner, A. W. Crawford, C. O. Nelson, and had an exhibit of their core oils and indestructible paint. Throughout the convention they made souvenirs of core sand in the form of tiny barrels useful as match holders. These were baked in the Wadsworth core oven in the Falls Rivet and Machine Company's booth.

OSCAR BARNETT FOUNDRY COMPANY, NEWARK, N. J., were represented by F. S. Barnett. They had an exhibit of flasks for all purposes.

THE BERKSHIRE MANUFACTURING CO., CLEVELAND, OHIO, showed in operation a Berkshire automatic molding machine for all classes of work from radiator loops to small brass trimmings. This machine was the center of a great deal of interest. The sand is fed to a rotary riddle and from thence it is elevated to a hopper, dropped in the flask, squeezed and ready for the metal, the whole operation consuming a very small amount of time. They also exhibited a hand worked, squeezing, pattern drawing molding machine using patterns on both sides of a steel plate, wooden plate, gated work with hard sand match also plates with patterns on one side. All these patterns may be run without changing the machine in any way. Representing the company were J. N. Battenfeld and C. F. Battenfeld.

HICKMAN-WILLIAMS CO., CINCINNATI, exhibited samples of northern, southern and Virginian irons, and 48 and 72 hour coke. The company's representatives were F. M. Eaton, H. Black, J. V. Byrd, R. S. Fox. The souvenirs from this booth was a very useful stylographic pencil.

THE DETROIT FOUNDRY SUPPLY CO., DETROIT, MICH., were on hand with an exhibit of cast iron chaplets and "Bull dog" shovels. Representatives were E. J. Woodison and W. B. Howard. The company is mailing visitors a souvenir pencil.

E. KILLING'S MOLDING MACHINE WORKS, DAVENPORT, IOWA, exhibited three different types of roll over molding machines including a universal roll over straight drop machine that deposits the mold directly on the floor eliminating, lifting and carrying. The company was represented by E. Killing, H. W. Langfelder, C. P. Aabye.

WALTER McLEOD & CO., CINCINNATI, had a large exhibit of Buckeye torches, etc. A new nozzle for sand blast was shown that is meant to operate without wearing out the nozzle. This is accomplished by leading two pipes to the nozzle and entering the sand in such a manner as to have it leave the nozzle in the center of an air jet which keeps the sand from coming in contact with the metal. A complete model of the McLeod water softner was also shown. This type is new on the market and is meant for use in power plants, laundries, etc. Representing the company were Walter McLeod, W. F. Stodder, W. F. Woodbridge.

THE DETROIT TESTING LABORATORY and the Toronto Testing Laboratory were represented by J. D. Stoddard and Hugh Lamont. Post cards booming Detroit for next year's convention were distributed.

THE SOLVAY PROCESS CO., SYRACUSE, were represented by G. A. T. Long, G. Drysdale, E. D. Winkwork and C. G. Howe. Samples of the well known Solvey Coke were shown and a useful souvenir distributed. This was a steel folding foot rule in a leather case.

HAWLEY DOWN DRAFT FURNACE CO., who were represented by F. C. Ringer, T. P. Gourley, D. R. O'Brien, had exhibits both in the main and temporary buildings. The former consisted of a ten ton tilting steel furnace and a 32 inch brass furnace. The latter was a 42 inch brass furnace capacity 500 pounds every 15 minutes. Souvenirs of this booth were cast iron ash trays and small buckles. The latter were cast iron running 320 to the pound and 160 to a gate. Gate and castings weigh 1½ pounds. The ash trays were made by D. & W. Fuse Co., Providence, R. I.

BROWN SPECIALTY MACHINERY CO., CHICAGO, who were represented by E. A. Rich, Jr., showed a hammer core machine in operation, a core cabinet and samples of diamond pattern lumber.

THE JONATHAN BARTLEY CRUCIBLE CO., TRENTON, N. J., were represented by Jonathan Bartley and L. H. Lawton. Their exhibit consisted of a large assortment of regular and special graphite crucibles in all shapes and sizes, also stirrers and stirrer handles. There were also five crucibles of clay handsomely painted and finished, which made a very fine showing. An interesting feature were three baskets such as are used by the natives of Ceylon in sorting graphite. These were filled with graphite showing three stages of fineness of the graphite which is all hand picked. A souvenir was distributed which was a match holder in the form of a crucible made of porcelain and set in a saucer.

THE PENTON PUBLISHING CO., CLEVELAND, publishers of The Foundry and The Iron Trade Review, were represented by R. E. Dennison, A. O. Backert, G. H. Griffiths, D. C. Warren, F. J. Ryan, W. B. Robinson and J. D. Morton. Their booth, which was furnished with large comfortable arm chairs for visitors, was decorated with photographs of past conventions.

THE FOUNDRY SPECIALTY CO., CINCINNATI, showed samples of Partine, Fluxine, and Faceine. This latter is a new product of this company and is used in place of resin or oil for smoking brass molds. They also exhibited castings which were made by the use of these products. Representing the company were F. W. Weissmann and W. S. Anderson.

THE JOSEPH DIXON CRUCIBLE CO., JERSEY CITY, N. J., were represented by D. A. Johnson, F. Krug, S. H. Doherty, F. Brandon, W. B. Allen, G. Neighbor, A. L. Hassis and J. A. Condit. Their exhibit consisted of an assortment of crucibles, stoppers, nozzles, and all kinds of refractory graphite ware. Two crucibles were arranged to have the appearance of being surrounded with flames the effect being obtained by the use of streamers of red tissue paper in a blast of air. A stick pin in the form of an imitation fly was given as a souvenir also a trick pencil and a "seven dollar pyrometer."

BURROUGHS ADDING MACHINE CO., DETROIT, showed their cost keeping, book-keeping, foundry cost keeping machines. Their pay roll machine (a recent invention) was also shown. This takes the workman's time for each day, total hours per week, rate, amount of earnings and also the total of entire pay roll. Representing the company were F. D. Wilde, C. M. Smith and F. H. Dodge.

A Group of Cleveland Supply Men.

THE HILL AND GRIFFITH CO., CINCINNATI, were represented by Wm. Oberhelman, John Hill, J. M. Glass, R. B. Hastins, F. Weissman and M. Z. Fox. A large assortment of foundry equipment was exhibited including shovels, riddles, brushes, smooth on castings, snap flasks, electrical grinders, waxwire machines, etc.

THE AMERICAN SMELTING AND REFINING CO., CINCINNATI, who were represented by H. Cantor, showed samples of their different metals, including American Flag Genuine Babbit.

THE CENTRAL FOUNDRY SUPPLY CO., COLUMBUS, OHIO, were showing their "Acme" parting and red facing substitute for plumbago. J. S. Ball and Wm. Fenton, represented the company.

THE WHITING FOUNDRY EQUIPMENT CO., HARVEY, ILL., who were represented by F. A. Rundel, R. H. Baurne and C. Hughes, showed their ladles ; a new design of tumbler with self-aligning bearings and friction clutch for battery use in place of the sliding pinion in large machines ; a drawer type core oven with overhead trolley for removing drawers ; an exhibition of the electrical and mechanical brake used on their traveling crane trolleys.

LANE AND BODLEY, CINCINNATI, showed a sample Corliss engine cylinder with gear attached, also one of their Corliss engine governors.

J. W. PAXON CO., PHILADELPHIA, had an exhibit consisting of samples of their various lines of foundry supplies. This included a rock over machine for general work, a special machine for brass foundries, a magnetic separator, aluminum flasks, the only bay rope exhibit at the convention and general molding machine supplies. The souvenir of this company was an exceedingly handsome ash tray of pressed metal. They also gave away a rattle. The representatives of the company were H. M. Baugher, L. A. Crandall, Geo. W. Moore, T. F. Kremer.

"CASTINGS," THE GARDNER PRINTING CO., CLEVELAND, occupied booth 103 and were represented by S. R. Lewis, R. T. Clegg, C. G. Kisner.

THE TABOR MANUFACTURING CO., PHILADELPHIA, exhibited a 30 inch power roll over machine with 12 inch power draft; an 18 inch hand roll over machine with 8 inch hand draft; a 10 x 13 inch power squeezer, a 14 inch power split pattern machine with 16 inch power draft. The souvenir of the company was a penknife which was mailed after the convention. Representatives were Wilfred Lewis, J. Ramsden, C. W. Coleman, C. H. Ellis, J. Coleman, Hugh Gallagher and John Pfendner.

MANUFACTURERS' EQUIPMENT CO., CHICAGO, were represented by Paul J. Goebel, who exhibited a 14 inch Warner-Swasey turret lathe with one of the Equipment Co.'s latest two jawed aero chuck. The feature of this chuck is the toggle joint arrangement for closing the jaws. It is arranged with supplemental masher jaws that can be adjusted independently of the toggle with a range of from 2½ to 4 inches, inclusive. This chuck is also arranged so that any ordinary manufacturers' box chuck may be used.

LODGE AND SHIPLEY, CINCINNATI, exhibited one of their 24 inch lathes with patent head.

KROESCHELL-SCHWARTZ, CHICAGO, ILL., had on exhibition a stationary gyrating flame crucible furnace and an oil pumping system connected to the blower of the furnace. The melting of the metal in the crucible is done from the bottom up, which permits of holding charcoal on top of the metal in the crucible. The furnace which is quiet in operation will make from 6 to 8 heads in 9 hours.

WILLIAM SELLERS CO., INC., PHILADELPHIA, were represented by Edward L. Hollies, showed two centrifugal sand mixing machines, one belt driven and the other motor driven. The latter was in operation throughout the convention showing how all kinds of foundry sands, core oils and compounds may be mixed centrifugally. The thoroughness of the machine caused many complimentary remarks.

GULICK-HENDERSON CO., PITTSBURG, were represented by J. W. Henderson and B. B. Strand. They had no exhibit beyond booklets, descriptive of their systems.

ED. E. SQUIER, ST. LOUIS, was represented by R. H. Squier and exhibited samples of their sand.

STIRLING WHEELBARROW CO., MILWAUKEE, had an exhibit of rolled steel flasks and wheelbarrows. They were represented by T. R. Smith.

ROBESON PROCESS CO., AM. SABLE FORKS, N. Y., had a very inviting booth. It was hedged in by fir trees in tubs which is significant of their product "Glutain." On hand were D. S. Robeson and L. R. Donald.

J. S. McCORMICK & CO., PITTSBURG, had on exhibit a sand mixing machine, taper flasks, ladles, etc. In operation was a rotary magnetic separator for brass chips and filings. They also had the J. S. McCormick "roadster" made up entirely of foundry supplies. Representing the company were J. S. McCormick, T. E. Malone and S. R. Costley. The souvenir from this booth was a serviceable three foot folding pocket rule.

STANLEY DOGGETT, NEW YORK, exhibited a miscellaneous lot of fancy castings showing the effect of Perfection Parting Compound on the work, in the smooth finish of the iron and brass. Samples of foundry talc, foundry charcoal, facing, fill-it iron and steel cement were also shown. Souvenirs were given away in the form of small pocket mirrors and pocket pincushions. The booth was in the hands of Stanley Doggett, A. J. Johnson, W. S. Rupert.

S. BERKENSTEIN & SONS, CHICAGO, ILL., were represented by Louis Berkenstein, S. M. Rush, J. B. Neiman, E. E. Berliner. Their exhibit consisted of samples of ingot copper, pig tin, pig lead, aluminum, antimony, phosphor tin, etc.

TAUNTON CRUCIBLE CO., TAUNTON, MASS., had an exhibit of crucibles and gave away as souvenirs a small crucible which can be used as a handy match holder. Their representative was A. J. MacCormack.

CURTIS-MUMFORD OVERHEAD MOLDER.

The Curtis-Humford Overhead Molder is a machine combining roll over and pattern draft with crane and hoist service. It is for use in large work and is of special use when pattern drawing is of the roll over variety. It is intended to overcome the difficulties met with in certain classes of work, the ramming which destroys the accurate mechanism necessary to the pattern drawing process. Other good features are included in the design of the molding machine, which are of interest.

The machine shown at the exhibition in Cincinnati is one having a capacity for handling molds 6 feet x 8 feet, weighing not more than 9,000 pounds when supplied with 80 pounds air pressure. The machine takes a follow boarded pattern with the flask upon it filled on the floor with sand, raises and transports it to the table of the jolt rammer, whence, after it has been rammed, it lifts it, and while turning it to the floor, rolls it by power with absolute smoothness and draws the pattern fairly from the joint while suspended. The method by which all this is accomplished will be apparent on reference to the photograph. It is this large cylinder which gives the machine its capacity of lifting 9,000 pounds six feet. When a foundry crane

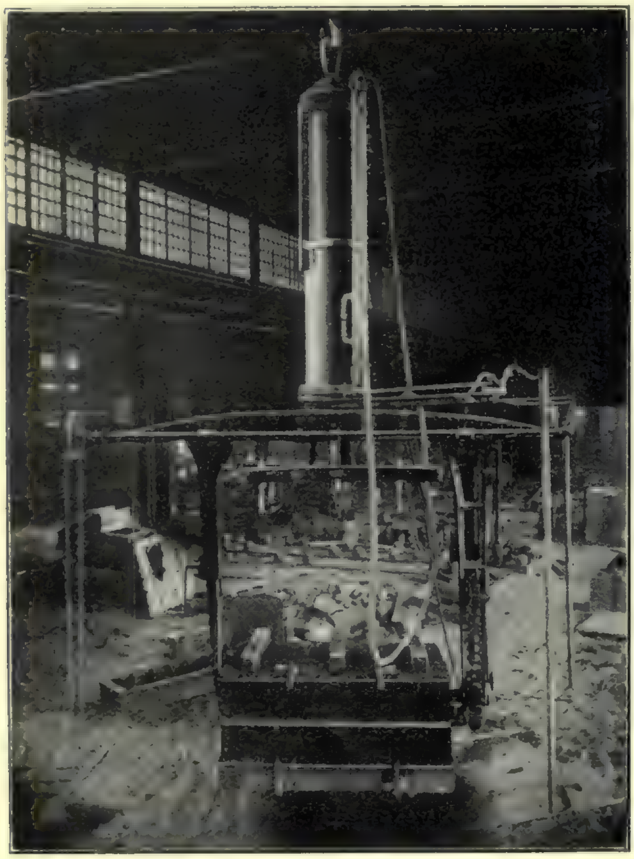


Fig. 1.—Machine After Ramming Before Rolling.

Fig. 2.—After Rolling, Pattern Drawn.

of large capacity is available the machine is limited only by the size of flask and the large cylinder at the top is not required.

Below and projecting from the bottom of the large cylinder is what appears to be a plunger of this cylinder. This is the pattern drawing cylinder proper, the plunger of which carries the four armed cross pendant from which are four small spuds. These four spuds slide readily in slots, and are never rigidly tightened. They are slid to such points on the back of a pattern or follow board as they may find resting place upon during the pattern drawing operation. While the mold is suspended on the hanger pendant from the cross rail, which hanger may be set to correspond with any length of flask up to 8 feet, the pattern drawing plunger, which is square, is dropped with its cross and the four spuds mentioned upon the back of the pattern or follow board. As soon as it contacts with the pattern or follow board it automatically sets up a pressure of 700 pounds thereon. As the valve controlling the roll over mechanism is now at lap so that the flask is free to adjust itself axially on the trunnions, the contact of the first two spuds which bear, throws the joint of the mold square in one direction with the line of pattern draft which is the line of the plunger. In order to complete the adjustment, the hanger oposite the one upon which the roll over cylinder and sprocket wheels are shown, is lengthened or shortened by an adjusting screw driven by a 12-inch hand crank through miter pinions. This brings the other two spuds in contact with the back of the pattern or follow board, thus squaring the mold joint with the pattern draft in this other direction.

Simultaneously with the pressing down of the spuds to square the joint with the line of draft, a pair of grab hooks at the end of the pattern drawing plunger seizes a button headed plate in the back of the pattern or follow board. Upon the starting of the pattern draft these pull the pattern from the sand while the four spuds still maintain a downward pressure which holds the pattern rigidly.

Before starting the pattern draft the flask is rapidly secured against rolling on its trunnions by the same mechanism which is used to roll it, and being so held, and the pattern also rigidly held, the pattern draft is absolutely clean, unaffected by uneven bottom boards insufficient bedding devices, etc.

The apparatus may be used with a special cradle for handling large split core boxes and also for shaking out and handling flasks if this is required of it.

No change in patterns, follow boards or flasks of any sort is required except a fixture for the roll over drive permanently fastened on end of any flask, wood or metal. It will readily be seen that it is not essential to the operation of this apparatus that the pattern should be secured to the follow board and drawn with them, which always involves a blind lift. It is one of its great advantages that the follow board may be loose and removed from the pattern before it is drawn which, as in the case of spur gears, gives an opportunity to watch corners which may stick and start with the pattern, and to nail such parts as will not draw without nailing. Inasmuch as neither patterns nor follow boards are in any way secured to the machine, but are simply picked up by it, it will take at random flasks which have been filled on their follow boards by a shovelling grab.

Firg 1 shows the machine after ramming, before rolling. Fig. 2 shows the machine after rolling, patern down. This shows the secondary cylinder after lifting the follow board with the pattern from the mold. The Curtis-Mumford Overhead Molder is manufactured by E. H. Mumford Co., 1223-25 Spring Street, Philadelphia, Pa.

IMPROVED CUPOLA, TWYER SYSTEM.

A system of twyers for a cupola has been designed and patented in the United States and Canada by John C. Knoeppel of 577 East Ferry Street, Buffalo, N.Y. These twyers are especially intended to effect the introduction of the blast at as low a pressure as possible so as to insure a low melting point with its attendant advantages.

The essential features of this twyer system are the air flues or mixing chambers, which insure a uniform pressure in all parts of the twyer system, together with special twyers for introducing a small amount of air above the melting zone. These upper twyers are so arranged that the amount of air passing through them can be regulated by suitable dampers.

This introduction of a large volume of blast at a low pressure insures the keeping of the melting point or zone in its original position as the heat progresses, providing the proper fuel proportion is maintained in the charges.

By referring to Fig. 1 it will be noticed that there is a series of flues extending up from the twyers inside of the cupola shell. These vertical flues are connected with one or more rows of small twyers placed well above the melting zone. The first object of these upper twyers is to supply a small amount of oxygen at different levels which will burn some of the carbon monoxide to carbon dioxide. The heat thus liberated will be to a large extent absorbed by the descending stock and will thus assist in preparing the material for rapid fusion when it arrives at the melting zone. Valves or dampers are provided for controlling amount of air flowing through these upper twyers or openings. Another advantage claimed for the upper twyers or openings is that at the end of the heat these passages can be thrown wide open, allowing a rapid circulation of air through them, which assists in cooling the lining down quickly.

Where thick linings are employed in very large cupolas, the main twyers are composed of two separate parts, a bottom and top piece, while for cupolas of smaller diameter the segments of the twyers are cast complete with top and bottom plates attached. To facilitate the removal of the twyers in case of repairs, two key twyers are provided, one at the front and the other at the back. The brick lining of the cupola is supported upon rings of angle iron riveted or bolted to the shell so that it is possible to remove the twyers or the lower portion of the lining for renewal, should this be found necessary.

Two of the twyers are provided with notches which are lower than the regular twyer system. These are intended as safety notches, and are fitted with fusible plugs at their outer ends, so that should the iron rise to these notches it will flow through them and escape by way of the fusible plug, thus warning the cupola man before the metal actually enters the twyers proper. The key twyers are usually placed at the spout and slag hole.

When the inside diameter becomes less than 56 inches, the amount of bosh must usually be reduced. To accomplish this, twyers with vertical faces are sometimes constructed. A slight bosh, however, is provided by placing a plate above the twyers, which is a flange fitting down over the lower edge so as to provide an overhang of one inch or more. This style of practically vertical lining is known as the "B" type, while the heavily boshed type, Fig. 1, is known as the "A" type of cupola. In other respects the two types are practically identical. The volume of air which must be introduced into a cupola is of necessity proportioned to the area of the cupola. As the diameter of the cupola becomes less, the necessary amount of air can be introduced through a twyer having less vertical height, and hence the smaller amount of bosh or overhang in the "B" type may still be sufficient to prevent the twyers from clogging or stopping.

A section of the cupola just above the twyer is shown in Fig. 2 which also illustrates the direction of the air current in the case of a cupola having a tangential admission for the air to the

outer wind belt. The arrows plainly indicate the course of the blast. This view also shows the key twyers very plainly.

Fig. 3 shows a section of the cupola at some distance above the twyers. The divisions of the twyers, however, are plainly shown by dotted lines, as are also the positions of the key twyers and the safety or overflow twyers. The projecting plates used on top of the twyers are also applicable to the standard style of twyers with a heavy overhanging bosh, and may be used to provide a more decided bosh or in cases where the cupola is to be lined down to a smaller diameter. The plate itself is usually designed to give an overhand of from one to two inches. Twyers of this style can be introduced into any cupola now in service.

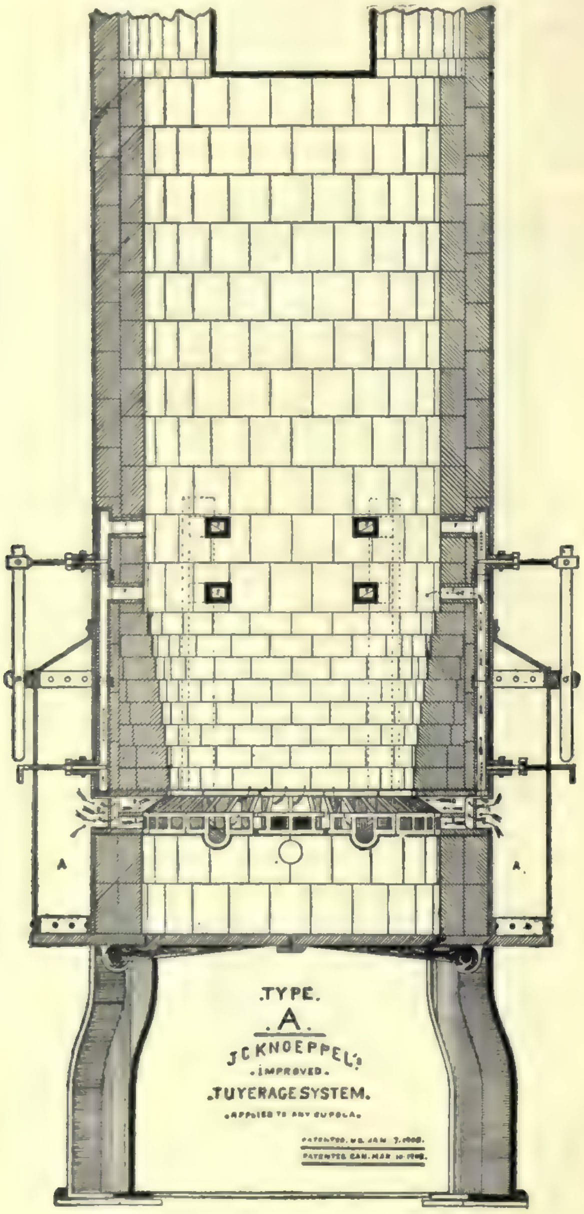


Fig. 1.—Section of Cupola, Boshed Lining.

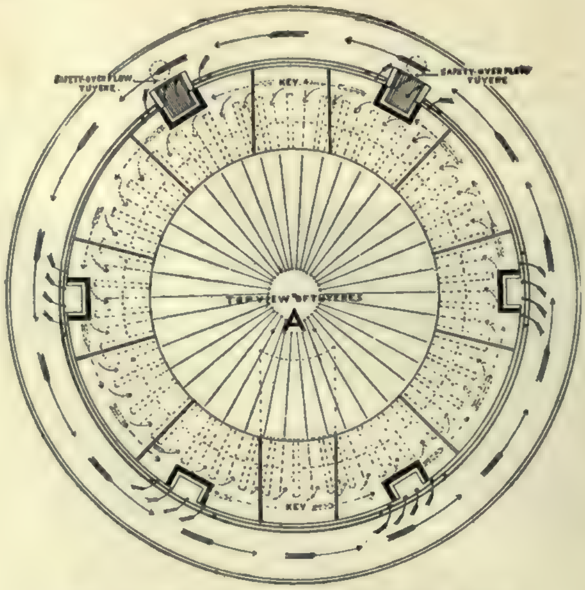


Fig. 2.—Course of Air Through Tuyere System.

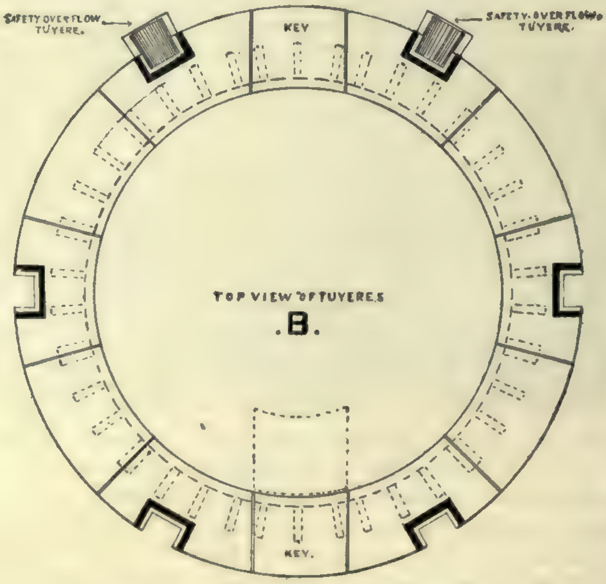


Fig. 3.—Arrangement of Various Parts.

THE CANADIAN RAILWAY CLUB.

On Tuesday evening, May 4th, the annual meeting of the Canadian Railway Club was held in the Windsor Hotel, Montreal. The business of the meeting consisted in hearing the reports of the various officers and committees, and the election of officers for the ensuing year.

The reports showed the club to be in a first-class condition. The membership is steadily increasing and the interest taken in the meetings is far from being languid. The present enrollment list shows 722 members. The club is also in very good condition financially.

After the business session an hour or so was devoted to an informal musical programme and refreshments were served.

The following officers for 1909 were elected: President, H. H. Vaughan; vice-president, A. A. Maver; second vice-president, A. A. Goodchild; executive committee, J. Coleman, A. W. Wheatley, R. W. Burnett, F. Ditchfield, C. Manning and P. R. Diamond; audit committee, W. H. Stewart, H. A. White, J. S. Johnstone; secretary, James Powell; treasurer, S. S. Underwood.

Announcement is made that the proposed Hamilton and Guelph Junction Railway will be built this year. The proposed line will connect with the C.P.R. at Guelph Junction and the C.P.R. is going to build the road.

New Mechanical Woodworker for Pattern Work

A High-Class Universal Milling Machine with Many Interesting Features Applied to Woodwork; Adaptable to All Kinds of Pattern Work and Core Making.

This mechanical woodworker has a number of novel and interesting features which make it applicable to the varying intricacies of pattern and core work, as well as a great many other operations in woodworking. Fig. 1 illustrates a very few of the many patterns, etc., that may be made on this machine.

The machine consists essentially of two parts, the machine proper and the table, which, with their universal movements form a complete machine requiring only minor adjustments for a large variety of work. It is substantially built and is capable of dealing with delicate and intricate pattern work and also the larger and heavier work. The movements are all simple and the machine is easily adjusted by the workman. Its special feature is that it is at once both a special machine and a common machine, as circumstances and convenience demand, and capable of completely finshing work without the necessity of rehandling.

The drive in all cases is a variable speed with reverse, and may be either direct by motor carried on the back of the machine, the motor spindle driving direct onto the cutter spindle, or intermediate by reversible and variable-speed motor driving onto the back shaft of the machine from any convenient position; or belt-drive direct through a variable-speed auxiliary countershaft.

The Table.

The table body or base is free to be moved bodily upon its foundation frame on ways and is conveniently actuated by a hand wheel. The table body can be instantly moved across the front of the machine from under the cutter spindle and away sideways altogether clear of the machine head, and when in this position the rocking arm with the spindle head may be rapidly tilted bringing the spindle into any required relationship with, or below the level of the table top. In addition to the lateral movement of the table body the table is provided with independent longitudinal and cross-motions. The table may be moved upon sensitive ball races by a feed screw actuated by a hand wheel at the front of the machine, which screw may be thrown out of gear when required, leaving the table free to be easily fed or floated by hand over the ball races while a right-angle motion is imparted by a rack and pinion also actuated by a hand wheel in front of the machine.

The table in addition to having a considerable vertical adjustment, can be turned in a horizontal plane through a complete circle, thus combining rapid right-angle, longitudinal cross and circular movements, whereby it is enabled to move circularly, lengthways, crossways, or even at any angle relative to the spindle at the will of the operator; the whole series of table movements being provided with quick, adjustable stops.

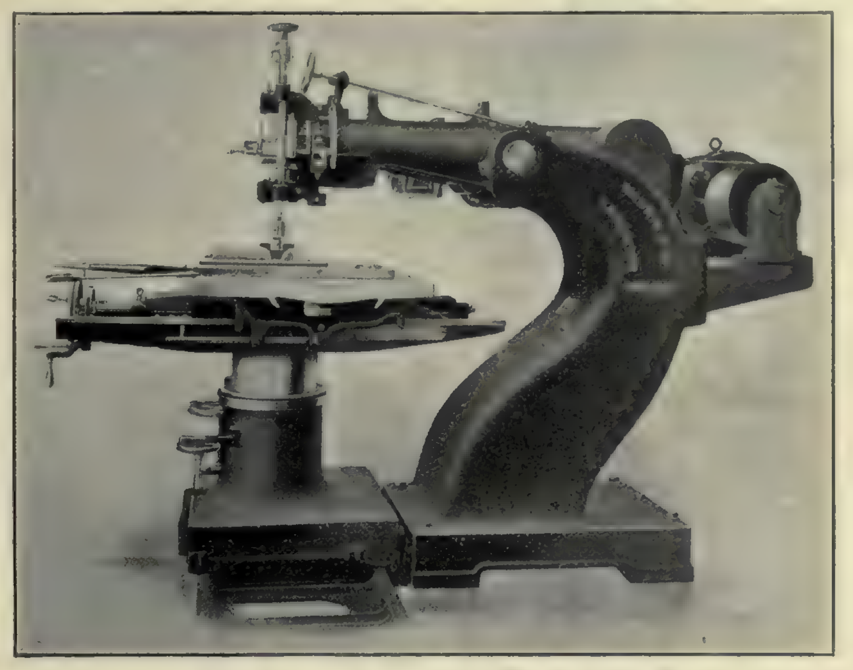


Fig. 2.—Latest Model Wadkin Mechanical Woodworker.

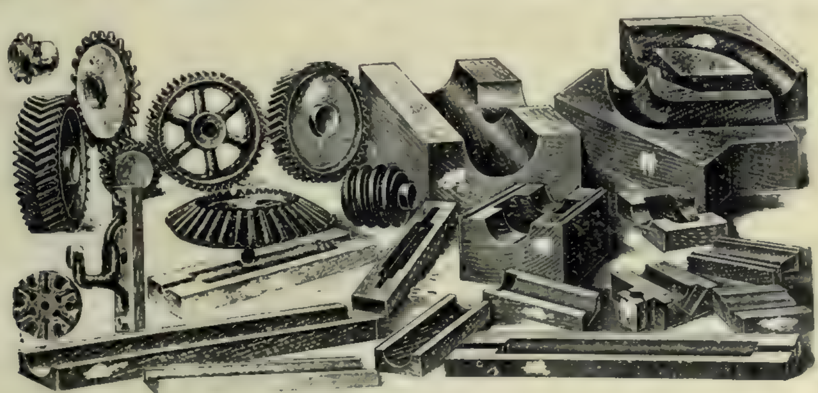


Fig. 1.—A Few Pattern Shapes.

Rocking Arm.

The rocking arm carrying the spindle head is sensitively balanced on the trunnions, which allows of the manipulation of difficult irregular-curved face work, a slight pressure of the hand only on the head of the machine being sufficient to cause it to follow any required form clamped to the machine table; the work being fed past the cutter by the screw, and the cutter spindle rising and falling over the form clamped down on the table top, thus enabling core boxes and other work with curves and shapes of a compound nature to be easily manipulated.

The spindle head is revolvable at the end of the rocking arm and suitable means are provided to maintain it in any desired position. In addition to the quick positive, self-locking lever feed and the sensitive screw feed of the spindle, the latter may be adjusted to suit the various positions of the feed lever.

Core boxes of almost every conceivable form can be made on the machine. Chamberings of almost any section or radius can readily be cut, also bends of all kinds, obtuse, return, compound, or at any angle with sockets or recessings.

Generally speaking, the cutters employed are simply shaped from flat bar steel and are carried in suitable cutter holders fixed in the chuck of the spindle.

The machine will cut patterns of gears, either helical, worm, bevel or spur, by means of a spiral head. The full range of usefulness of the machine may be judged from the following partial list of operations to which the machine lends itself: Molding, straight or ir-

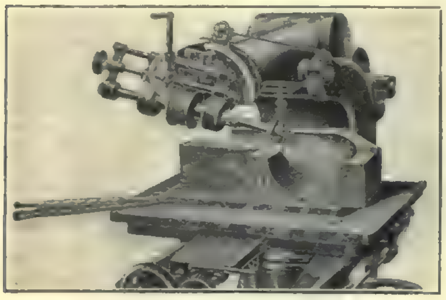


Fig. 3.—Operating on Large Section Corebox.

regular; cross-grooving, trenching, halving and jointing; recessing and routing; rounding curves; boring and slotting holes at any angle; facing, sinking; molding straight or curved arms of wheels and shaping bosses; recessing and trenching of every variety and description; boring up to 6 inches in diameter, or any larger size by rotating the work table; filleting; cutting dowels; crosscutting; straight-corner locking, half lapping, jointing, plowing; dovetailing; slot mortising and recessing; square mortising; single and double tenoning and scribing; panel raising and molding to any design, square or irregular; turn-

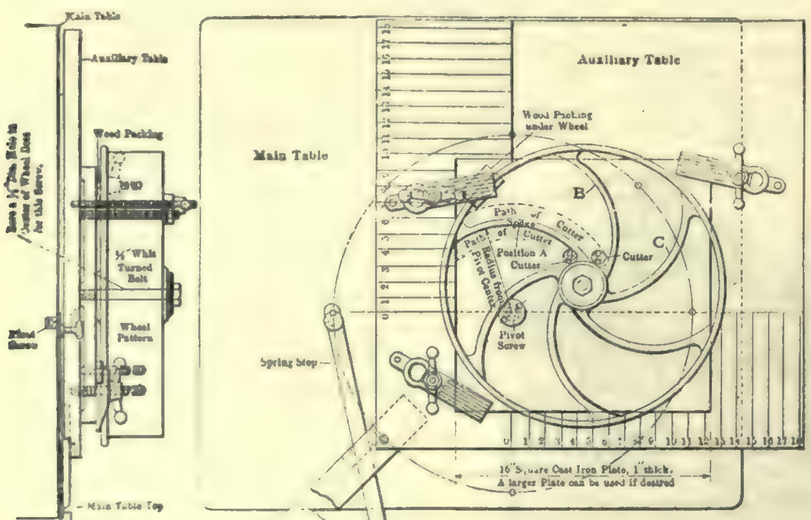


Fig. 4.—Shaping Arms of Pulley Pattern.

ing spiral and ornamental twists, etc., to any design, size or length; fluting, etc.

Fig. 2 is a view of the latest model with double cone ball bearings, variable speed, motor driven. Fig. 3 shows the machine operating on a core box of 12 inches diameter. In this operation the head is deflected, and canted to a suitable angle, as shown. The cutter head shown is one of the four arm expanding cutter heads; this type is used for core boxes from 7-in. to 14-in. diameter.

Fig. 4 shows a method of forming the arms of a pulley pattern. The pattern is mounted on a stud secured in a cast-iron plate which is fastened to the auxiliary table. As the table is swung about its pivot, the arm A is operated upon by the cutter first on one side and then on the other; then the pulley is indexed to bring arm B into the position first occupied by A and the second arm finished. The same procedure is followed for each arm, the whole series thus being shaped expeditiously.

With this machine a general equipment and a full range of cutters, mostly of the expanding type, and appliances of various kinds may be supplied to suit any particular class and kind of work to be done. The machine is manufactured by Messrs. Wadkin & Co., of North Evington Engineering Works, Leicester, England. The Oliver Machinery Company, of Grand Rapids, Michigan, have the selling rights for America, and had it on exhibition at the A.F.A. convention.

CENTRAL RY. AND ENGINEERING CLUB.

The regular monthly meeting of the Central Railway & Engineering Club, Toronto, was held in room 315, Union Station, on May 18. C. Geldart, erecting shop foreman, G.T.R., Stratford, read a paper on "Use of Pneumatic Tools."

The second annual picnic will be held at Jackson's Point, June 19, via Metropolitan Electric Ry., leaving the station at North Toronto at 8.00 p.m. Tickets for the round trip, including dinner at Jackson's Point are $1.00. Tickets may be obtained from any member of the Reception Committee, the Secretary, C. L. Worth, Room 409, Union Station, Toronto, or at North Toronto before departure on the morning of the 19th.

A baseball match between the supply men and mechanics will take place and a suitable program of games has been arranged for. By the kind permission of Robert Patterson, Master Mechanic of G.T.R. Works, Stratford, the shop band will accompany the excursion. Members and their friends are cordially invited.

SOME LARGE ENGINES.

Goldie & McCulloch, Galt, have a number of orders under construction for some western cities. They are building for the city of McLeod a 400 h.p. engine 14 and 28x30, 150 r.p.m. It is a vertical cross compound Corliss, direct connected to a 260 k.w., 60 cycle, 3 phase, 2200 volts A. C. generator furnished by the Northern Electric, Winnipeg. There is also a 10 and 16x15 jet condenser.

For the city of Edmonton they are building a 1800 h.p. cross compound horizontal engine, 25 and 50x36, 120 r.p.m., direct connected to a Canadian General Electric 1500 k.w., 60 cycle, 1000 volts A. C. generator. The engine is being equipped with a Richardson sight feed oiler and Tripp's metallic packing. A jet condenser 14 and 26x24 is also being supplied.

They are also supplying Edmonton with a tandem compound Ideal engine 8 and 16x12, direct connected to a C. G. E., 75 k.w., D. C. 275 r.p.m. generator.

Edmonton is installing other equipment, including a 300 k.w. Canadian Westinghouse, generator, two 300 k.w. Crocker-Wheeler generators, one 600 h.p. Robb-Armstrong engine, two 600 h.p. Bellis & Morcom engines and eight B. & W. boilers of 400 h.p. each. A 6,000,000-gal. Inglis pump, described in the April issue of The Power House, is also being installed.

At the annual meeting of the Winnipeg Electric Railway it was decided to issue $1,500,000 in new stock for extensions and improvements to the system.

The London & Northwestern Electric Railway, from London to Sarnia (65 miles) will be begun this season. About 50 miles of branch lines will be constructed next year.

INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News.

Foundry and Machine Shops.

The Lee Mfg. Co. propose to build a new foundry at Pembroke.

The American Laundry Machinery Mfg. Co., Chicago, contemplate locating a Canadian branch factory in Toronto.

The International Roturbine Engine Co., of America, Minneapolis, propose to locate a Canadian branch factory in Winnipeg.

The Bond Transmission and Foundry Co., of Mannheim, Dakota, intend locating a branch in Canada, and are looking over the possibilities of Alexandria, Ont.

The E. Long Mfg. Co., Orillia, will build a new plant at a cost of $30,000, and will double their present staff. It is the intention of the Long Company to add a boiler plant to their machine department.

P. H. Whitington, of Cleveland, and T. H. Russell, of Geneva, Ohio, have purchased the business of Maple Leaf Harvest Tool Co., Tillsonburg, and will conduct the same without any change in the firm name.

The works of the Provincial Steel Co., Cobourg, were formally opened on May 21, when the Council, Board of Trade and citizens inspected the new plant which is now ready for operations, just six months after work of construction was started.

The Capital Scale, Brass and iron Foundry Co., Ottawa, has purchased a large lot on which a factory will be erected. Construction will be begun at once. The factory will be for the manufacture of special patents and devices and there will be a foundry in connection.

The by-law granting the Structural Steel Co. a free site for the erection of a factory and exemption from taxation was passed by Sherbrooke ratepayers. The company will erect a plant valued at $25,000. The manufacture of bridges and boilers will be the main industry.

Arrangements have been made for the addition at the Soo of an extra furnace to the existing open-hearth plant, to increase the production of steel. An additional blast furnace for the production of pig iron will also be installed. The construction of these furnaces alone entails an immediate expenditure of at least $1,000,000.

Welland has secured another industry in the Canadian Seamless Steel Co., manufacturers of bathroom fixtures and all heavy articles of pressed steel. A plant to cost $125,000 will be built, and 75 hands will be employed at the start, to be increased to 200 by January 1, next. The parent company of the local industry is the Seamless Steel Mfg. Co., of Detroit.

Allan McAvity, Andrew Jones and Arthur M. Irvine, have just completed a deal by which they have secured control of Parker Bros. foundry, Montreal. Mr. Jones is engaged in the machinery business in Montreal and McAvity and Irvine are managing the Canadian business of the Buffalo Forge Company. The venture will not be allowed to interfere in any way with the present businesses of the three proprietors. The property will be considerably improved and some new machinery installed.

The foundry of Butterworth & Co., Limited, erected in 1874, has been sold to Fleming Grate Bar Co., an organization composed of Ottawa men who will continue the foundry under the name of the Butterworth Foundry Co., for the manufacture of stoves, ranges and Fleming Grate Bars. For this purpose the factory will be enlarged. The Fleming Grate Bar people will increase their capitalization from $40,000 to $89,000. The officers of the company are: H. W. Chamberlain, president; A. F. Chamberlain, secretary-treasurer; Jas. A. Gardner and J. M. Fleming, directors.

Barrie freeholders have endorsed an agreement made between the town and the Weber Foundry Co. for the establishment of a manufactory for gas producer plants, gas engines, etc. The town gives a loan of $40,000, repayable in twenty years without interest, exemption from taxation, and some concessions in water and light. The company must have site, plant, etc., valued at $60,000, of which at least $35,000 must be fixed plant and machinery; must employ at least 50 men continuously, with an annual pay-roll of not less than $25,000. Simon Dyment is to be President of the company, and the chief men associated with him are Mr. E. C. Hill and Mr. Wm. Thompson, of Toronto.

The new buildings and extensions of the Victoria Machinery Depot replacing those destroyed by fire about a year ago are nearing completion. The frame work of the boiler shop, the largest of the extensions to be made, has been erected and will be rushed to completion. In this structure, which is 102 feet long by about 90 feet wide, will be housed an entirely new boiler plant which has been shipped direct from England. Among the installations will be a hydraulic rivetter, an accumulator and pumps, an hydraulic flanger, a plate edger, planing machine, a cold sawing machine and a new plate furnace. In the machine shop, now running full blast, a fine lot of new and up-to-date machinery has been installed, and the present shop, 168 feet long will be lengthened by 24 feet.

Municipal Enterprises.

Yarmouth, N.S., is seeking authority to issue $80,000 for waterworks purposes.

Portage La Prairie ratepayers will be asked to vote $50,000 for waterworks purposes.

Thessalon, Ont., will spend over $9,000 on a waterworks and electric lighting system this year.

Carman ratepayers will vote on a by-law to raise $25,000 for the completion of the town waterworks system.

Gravenhurst ratepayers will probably be asked to vote on a by-law to raise $20,000 for a new waterworks system.

Estevan, Sask., ratepayers have approved by-laws to raise $30,000 for a water works system and $10,000 for a trunk sewer.

Vernon's waterworks extension is estimated to cost $58,000. A by-law for the construction of this work will be voted upon.

The Ontario Railway and Municipal Board has validated Cobalt's by-law to raise $75,000 for sewerage and waterworks system.

A by-law will be voted on at Wetaskiwin, Alta., to issue $7,000 debentures for the purpose of improving the fire fighting system.

Yellow Grass, Sask., ratepayers have passed the installation of the high pressure system at a $1,000 bonus to the electric light and power plant.

Henault & Heffernan, Montreal, have been awarded the contract for laying of a system of sewers for the town of St. Pierre, to cost $100,000.

Yarmouth Town Council decided to borrow $12,000 for the extension of the town water main and $6,000 for the completion of the Milton engine house.

The Edmonton City Council awarded the contract for the supply of the piping for the new power plant to the Babcock & Wilcox Co. at $6,770 for the piping complete and erected.

Tenders will be received until June 14 for the manufacture and installation of one or two pumping units of capacity of 3,000,000 Imperial gallons each per 24 hours, and waterworks pumps, with turbine water wheels, etc., complete for the Peterboro waterworks.

The following tenders for material required in the installation of the high pressure system at Victoria were accepted: Fine wire, Hawkins & Hayward, 18½ cents per lb.; stempipe line, Marine Iron Works Co., $350; water suction connections and valves, Marine Iron Works Co., $450; condensing equipment, tender not awarded though the apparatus offered by the Hutchinson Bros. Co., the lowest tenderers, at $1,750, is recommended.

Railway Construction.

The C.P.R. purpose to double-track its line between Montreal and Farnham.

Port Arthur is advertising for materials for the extension of its street railway system.

The Stratford Tramway Co. propose building a street railway in that town.

Construction will shortly be started upon the C.N.R. branch from Emerson to Winnipeg.

Construction work will begin at once on the G.T.P. lines north and south from Melville, Sask.

The G. T. P. has started work on the construction of a line from Wainwright to Calgary.

The Mount McKay and Kakabeka Falls Railway at Fort William will be constructed at once.

Janse & McDonnell, Lethbridge, have secured the contract for the construction of the C.N.R. cut-off at Stanley Junction, west of Port Arthur. The work is 10 miles in length and involves the moving of about 300,000 cubic yards of earth and rock.

Tenders will be called in a few days for the grading and construction of the Alberni extension of the E. & N. Ry., from French Creek to Alberni. This line is opening up a very fine country and will mean much to Vancouver Island when finished.

A by-law has been introduced in the council of the municipality of Burnaby to grant a forty-year franchise to the British Columbia Electric Railway Co. It is proposed to construct an electric line from the east boundary of Hastings townsite through the municipality.

Electrical Notes.

Lethbridge ratepayers passed by-laws totaling $200,000, of which $153,000 is for a power plant.

Victoria ratepayers have approved the by-law to raise $153,000 for the proposed power plant.

The British Columbia Electric Railway Co. will immediately begin the construction of thirteen miles of tramway extensions in the eastern end of Vancouver. They have been granted a 40-year franchise.

The Vancouver Power Co., a subsidiary concern of the British Columbia Electric Co., have been granted permission by the provincial government to raise their Coquitlam dam and thereby obtain an extra 1,000 horse power.

The Couteau Power Co. which develops energy at Shuswap Falls, twenty-six miles east of Vernon, B. C., with almost unlimited capital behind the project proposes to develop 8,000 horse power in units of 1,000 each to sell in Kamloops.

The panelboards for the St. Anne's Convent, at Lachine, Que., are being furnished by the Hill Electric Switch & Mfg. Co., Montreal. The wiring is being done by Messrs. Picard & Lalonde, of Montreal. The new factory for the Canadian Spool & Cotton Co., Montreal, is beinging equipped with panelboards and cabinets, manufactured by the Hill Electric Switch & Mfg. Co., 1560 St. Lawrence Boulevard, Montreal.

At the Quebec Legislature buildings the sale by auction took place recently of two water powers. The first group, the Kai Kai Ke Falls, was secured by W. McLea Walbank, the price paid being $3,001. The second, the Des Ites Rapids, was sold to Mr. O'Brien for $3,005. By the terms of the sale the water powers become the property of the highest bidder for a period of 75 years, upon condition that the owner spends $300,000 on the construction of power houses, etc., before three years.

The contracts have been awarded for the cables and conduits for Toronto's electrical distribution plant. The contract for the cables goes to the British Insulated and Helsby Cables, Prescot, England. The prices vary from twenty cents to $1.34 per foot, according to the different sizes and voltages. From 75,000 to 100,000 feet of cable will be used. The contracts for the conduits will go to the American Sewer Pipe Co., of Akron, O., the price being 4 7-10 cents per foot. The single duct conduit will be used.

The rates for house lighting in Toronto announced by the city's electrical department show that the city will probably charge three cents per kilowatt hour, with a charge of ten cents per month for each room in the house. At the present time the Toronto Electric Light Co. has a net rate of eight cents per kilowatt hour, with an additional charge of 25 cents per

month for meter rent. The city will make no charge for meter rent. Under the present rate a six-roomed house using 20 kilowatts pays $1.85 per month. Under the proposed city rate the monthly bill would be $1.20.

A meeting of representatives from Milton, Acton, Brampton and Georgetown was held in Georgetown recently to consider the cost of procuring electric power from Niagara Falls. Quotations were read from the Hydro-Electric Power Commission, the prices being for 24 hour power, based on a double circuit 110,000 volt line from Trafalgar to Georgetown, with an interswitching station at Trafalgar and a step-down station at Georgetown, from which point the power would be distributed to the four municipalities at 13,200 volts. The cost would be Georgetown for 800 h.p. $27.17; Brampton, for 600 h.p., $28.93; Milton, for 500 h.p., $28.56; Acton, for 600 h.p., $30.46. These amounts include all costs of transmission and transformation distribution at 13,200 volts and power at Niagara Falls at $9.40 which will be reduced to $9.00 as soon as the quantity used by the Commission exceeds 25,000 horse power. It is estimated that $5.00 per h.p. per annum added to the above rates would pay all expenses of installing.

Structural Steel Notes.

At a meeting of the Puslinch Council, the Stratford Bridge Company was awarded the contract for the steel superstructure at $1,307.

The Hamilton Bridge Works Co., Hamilton, have been awarded the contract for the erection of the steel structure of the main factory of the Sydenham Glass Co., at Wallaceburg, Ont.

It was decided at a joint meeting of the civic committees of Edmonton and Strathcona, to appeal to the C.P.R. to proceed with the proposed railway bridge over the Saskatchewan, which would be assisted by the two cities and by the Government.

At a recent meeting of the Vancouver Board of Works, City Engineer Clement reported that the cost of a bridge over the Ninth Avenue east ravine at Glen Drive would be $7,100, of which the B. C. Electric Railway Company was to pay $3,800. It was recommended that the work proceed.

Planing Mill News.

The Watt Milling Co., Toronto, have been granted a permit to erect a planing mill at a cost of $10,000.

Thessalon, Ont., ratepayers have approved a by-law to loan $10,000 to a saw mill concern which will expend $25,000.

Among the new enterprises shortly to be added to the industries of Revelstoke, B.C., is the Revelstoke Sash and Door Factory, which is now in process of erection.

$350,000 damage was done by a fire early on May 6 which wiped out the main buildings and sawmill of the Northern Pacific Lumber Co., Barnett, B. C. The mill was owned by McLarens, Ottawa.

The Brooks-Scanlon Lumber Company, of Minneapolis, which some time since announced its intention of erecting two or more large sawmills on the Fraser river, is seeking a site close to New Westminster for the first mill.

Fire on May 4 almost completely wiped out the little town of Westley, B. C. Only two buildings were left, office and cookhouse belonging to the Yale Columbia Lumber Co. The company's mill, valued at $50,000, a stock of lumber valued at $50,000 more, as well as all the employes' houses and other buildings belonging to the firm, were completely destroyed.

Building Operations.

The Lufkin Rule Company, of Canada, has begun work on the new 160 foot extension to their factory at Windsor.

The Tudhope Co., Orillia, will erect a large new addition to their works to manufacture motor cars and motor buggies.

The Grey & Bruce Portland Cement Co. will transfer its operations from Owen Sound to St. Marys, where a $250,000 plant will be erected.

The Western Fire Clay Products, of Weyburn, Sask., which was recently incorporated, with a capital of $600,000, will commence building operations this spring.

The East City furniture factory, Peterborough, is to be enlarged during the coming summer. An addition one-half the size of the present building will be built to the rear.

Orillia has passed a by-law to grant the E. Long Co., a free site for a new factory and plant and fixed the assessment. The company agree to increase the employes by over 50 per cent. They now employ 70.

Taylor & Taylor, Brantford, are asking for tenders for the new Sanderson-Harold Co. factory plant at Paris. There will be a main building, 300 x 62, two storeys, a boiler and engine room 40 x 60, and dry kiln and warehouse.

The Sydenham Glass Co., Wallaceburg, recently burned out, is securing from the Pittsburg Construction Co., plans for a mammoth steel structure to replace the old factory. The new building will be entirely of steel, brick and concrete. Armstrong & Dickson of Pittsburg are arranging for tanks and machinery.

General Manufacturing News.

The Keystone Engineering Co., Toronto, purpose locating at Wiarton.

Sussex, N.B., will have a new industry to manufacture the newly invented Acme steel ladder, controlled by the Acme Steel Ladder Co.

D. Perry of the Watt Hose Co., Woodstock, proposes to build a hose coupler factory at Port Hope.

The Hercules Specialty Co., of Grove City, Mich., makers of sanitary shields and toilet paper services, propose establishing a branch factory at Guelph.

The Dodd and Struthers Co., with headquarters in Des Moines, Iowa, has established a branch Canadian plant for making lightning rods at Sherbrooke.

The Expanded Metal Co., Toronto, have purchased the Oxley acetylene welding process and will employ an additional forty men in manufacturing plant for using that process.

Woodstock, Ont., has given a site for a factory to the Watt Hose Coupler Co., and it is likely a site will also be given to the Russell Harvesting Machine Co. for the building of a plant.

It is rumored that Calgary may have a nail factory in the near future. The Alberta Wire Nail Co. have been negotiating with The Gordon Nail Co., of St. John, for the purchase of their plant, and if the deal goes through the plant will be transferred to Calgary.

Purity Ware, Limited, is a new company which will erect a large factory at Peterboro to manufacture all kinds of enamelware, galvanized iron ware and range boilers. $150,000 worth of machinery will be installed and 100 men will be employed at first, which may later be increased to 500.

Thornbury, Ont., has passed without a dissenting vote a by-law to loan by way of bonus $10,000 to the Thornbury Transportation & Reduction Co. to establish works. In addition they also give a free site for twenty years with harbor and water privileges. This company, besides employing a line of steel vessels, intend operating an iron smelter.

The Manitoba Rolling Mills Co., of Winnipeg, is prepared to expend $200,000 on extensions to its property and plant. This means increasing the capacity of the plant to four times what it now is. Initial plans have been prepared which call for four furnaces. With these it will be possible to work double gangs on both the night and day shifts, giving a total output of from 75 to 100 tons of finished iron per day.

Trade Notes.

Owing to increased business, C. H. Johnson & Sons, Ltd., Montreal, are putting up an addition to their plant. They are makers of wire window guards and other wire goods.

The Detroit Foundry Supply Co., have purchased the business of the Detroit Platers and Polishers Supply Co., who have manufactured various compositions, such as Tripoli, Crocus, Vienna Lime, etc., together with the handling of platers and polishers' supplies and that they contemplate manufacturing this material in the future.

Edgar-Allen & Co., Ltd., of Sheffield, England, have moved into their own new office and wareroom at 330 St. James Street, Montreal. Mr. Thos. Hampton is their resident representative. Full ware stocks will be carried in all their standard tool steels. Their business relating to cement plants, cement machinery, manganese castings, tramway points, crossings, etc., will be transacted from this office.

New Companies Incorporated.

John Watson & Son, Montreal; capital $49,000; to manufacture iron work. Incorporators, R. T. Hencker, A. H. Duff and W. S. Johnson, Montreal.

Superior Steel Co., Toronto; capital, $250,000; to manufacture metals and products thereof. Incorporators, R. W. Hart, S. Webb and A. C. Bedford-Jones, Toronto.

Oil and Gas Producers, Hamilton; capital, $1,000,000; to sink and develop oil and gas wells. Incorporators, R. L. McIntyre, J. M. Sinclair and O. G. Carscallen, Hamilton.

Western Canada Power Co., Montreal; capital, $5,000,000; to carry on business as light, heat and power company. Incorporators, J. W. Burrill, G. P. Wilson and L. R. Warden, Montreal.

Chapman & Walker, Toronto, capital, $50,000; to manufacture all kinds of electrical, gas, steam and other machinery. Incorporators, J. S. Lovell, Wm. Bain and R. Gowans, Toronto.

La Raquette Water Works, Rigaud, Que.; capital, $45,000; to construct and operate a system of waterworks. Incorporators, J. H. Redpath, J. J. Riley and F. G. Bush, Montreal.

Steel Reesor Co., Toronto, capital, $60,000; to manufacture stoves, furnaces, engines, boilers, plumbing and hardware supplies. Incorporators, J. Reesor, C. W. Steel and Geo. Hickey, Toronto.

Canadian Sheet Steel Corporation, Morrisburg; capital, $150,000, to manufacture every description of iron, steel, tin and other metal work. Incorporators, A. White, J. F. Hollis, and T. H. Wilson, Toronto.

The Sylvester Auto Thresher and Engine Co. has been organized with capital of $500,000 to manufacture in Winnipeg threshing machines and other farm implements. It is a branch of the Sylvester Mfg. Co., Lindsay, Ont.

B. Greening Co.

The B. Greening Wire Co. have just issued an attractive series of catalogues of their various products, comprising wire cloth, perforated metals, wire lathing, wire rope, wire chains, wire guards, counter railings, etc., the whole bound in one handsome volume for the use of their agents. Not the least interesting feature of the catalogue is the historical page. The name Greening appears to have been associated with wire for many centuries, the first needle factory in France having been started by a Greening, and later in England pins and needles were made by one of the same family. Benjamin Greening came to Canada in the fifties and became one of the pioneers of the wire industry. At his death he was succeeded by his son, S. O. Greening, who built the new works, and is president of the existing company. The works of the B. Greening Wire Company are up-to-date in every respect, and cover an immense area, giving employment to about 350 hands, the pay list running up to $3,000 weekly. The catalogue comprises a handsome volume of over 400 pages, with special illustrations of the works and of the different departments, as well as of all the various articles which the firm produces. The press work and typographical details are excellent, the whole being bound in a dark green cloth, appropriately lettered in gold.

G.T.P. Shops, Winnipeg.

A number of contracts, involving the expenditure of a very large sum of money, have been let by the firm of Haney, Quinlan & Robertson, who have the general contract from the government for the erection of the Winnipeg shops of the National Transcontinental railway. The sub-contracts include all the plumbing, the direct and indirect heating, the mill work and the painting and glazing on the various buildings. All work will be done by Winnipeg contractors, who have been engaged for some time in undertakings of this character in Winnipeg.

The iron work on the buildings, is in the hands of the Manitoba Iron Works, the contract for that part of the building having been let some days ago. Other contracts are as follows:

Plumbing, dieect and indirect heating, Cotter Bros.

Mill work, the Rat Portage Lumber Company.

Painting and glazing, the Taylor Painting and Decorating Company.

The following figures show the proposed extent of the buildings:

Locomotive machine and erecting shop 170 by 612 feet, 47 feet high.

Boiler tank shop, 185 by 210 feet, 47 feet high.

Stores and scrap shop, 40 by 220 feet, 47 feet high.

Forge shop, 100 by 260 feet, 47 feet high.

Grey iron foundry, 130 by 200 feet, 47 feet high.

Power house, 110 by 150 feet, 49 feet high.

Cleaning room, 48 by 80 feet, 25 feet high.

Locomotive, carpenter and pattern shop, 70 by 100 feet, 43 feet high.

Stores, 60 by 200 feet, 18 feet high.
Oil House, 40 by 60 feet, 15 feet high.
Wheel foundry, 92 by 135 feet.
Engine house, 170 feet radius, 1,068 feet circumference, with additional shop 50 by 200 feet.
Freight car shop, 200 by 600 feet.
Paint shop, 100 by 325 feet.
Coach shop, 125 by 250 feet.
Planing mill, 100 by 300 feet.
Lumber shop, 60 by 115 feet.
Dry kiln, 40 by 50 feet.

New Manufacturers' Agency.

Norman Macdonald, recently buyer for Rice Lewis & Son, Toronto, has been appointed sole sales agent for Ontario for the Carborundum Co., Niagara Falls, N.Y., manufacturers of abrasive materials. Mr. Macdonald will take on other agencies more particularly in tools and supplies for factories. He has established offices and warerooms at 30 Front Street east, Toronto.

Toronto's Filtration Plant.

Contracts for the construction of the civic filtration plant on Toronto's Island and for equipment for the filtration plant have been awarded. The following were the successful tenderers: Main contract, Messrs. Dill, Russell & Chambers, $568,128.60; cast iron pipe and specials, Canada Foundry Co., $10,891.70; gate valves, Ludlow Valve Co., Troy, N.Y., $8,712.95; sluice valves, Coffin Valve Co., Boston, $85,209; nenturi meter castings, John Inglis Co., $2,891; nenturi meter-indicating apparatus, John MacDougall, Caledonian Iron Works, Montreal, $3,318; sand washer castings, Canada Foundry Co., $871.20; steam centrifugal pump, John MacDougall, Caledonian Iron Works, $9,484; screw pumps, Allis-Chalmers-Bullock Co., $7,049; electrically-driven stage pumps, Allis-Chalmers-Bullock Co., $5,234; drainage pump, John Inglis Co., $1,600; boilers, John Inglis Co., $2,750; and manhole casting, Canada Foundry Co., $8,890.35.

Greatest Bridge in World.

The Canadian Pacific Railway is now constructing over the Belly River at Lethbridge, Southern Alberta, the largest bridge in the world. It is more than double the height of the ill-fated Quebec bridge. It will be 307 feet above the water level and 5,327 feet in length. The cost of the structure will be $1,500,000. The Lethbridge structure is not as long as the Victoria bridge in Montreal, which is nearly two miles, or the Firth of Tay bridges, but in each of these cases the headway is much less. It is nearly five times as high as the Victoria bridge at Montreal, and over twice as high as the famous Tay bridge. Other high bridges which approach the Lethbridge giant in length are the bridge over the Dnieper at Japkaterinoslav, Russia, which is 4,557 feet in length, the Alexandrowski bridge, over the Volga near Syzran, 4,871 feet; the Severn bridge, 4,162 feet, and the Empress bridge, over the river Sutlej, on the Indus Valley Railway. The structure which spans the Victoria Falls of the Zambesi River has the advantage of the new C. P. R. bridge in height, but fails in comparison in length. The concrete foundation of the structure at Lethbridge goes down to 24 feet below low water, and stands on hard shale. Twelve thousand tons of steel, 18,000 cubic yards of concrete, 20,000 barrels of cement, and 15,041 piles are being used in its construction.

Overhead Carrying Systems.

W. D. Beath & Son, 193-195 Terauley St., Toronto, installed an overhead carrying system in the works of Frank H. Fleer, Toronto. This is for the conveyance of bags of chicle from the cars to warehouse. The chicle is weighed on the track, deposited in the warehouse from which it is carried to elevators in the main factory as required. An electric carrier system has been installed in the Cosgrove Brewery for elevating and carrying barrels weighing 1,300 lbs. Other instalations include J. Fleury's Sons, Aurora, Ont., for carrying molten iron from the cupola to molding floors and Belleville Iron & Horse Shoe Co., Belleville, Ont., where a considerable saving was made. Some instalations are now being made including an overhead carrying system in the works of the Ontario Wind Engine & Pump Co., and Wagstaffe Ltd., Hamilton, manufacturers of preserved fruit. A sytem has just been completed in the works of the Metal Shingle and Siding Co., Montreal, and work has been commenced on machines and tracking for the Hygienic Dairy Co., Vancouver. A system is also to be installed in Edmonton dairy.

W. D. Beath & Son are planning to enlarge their works to take care of their increasing business. Besides the electric hoists and trolleys, hand hoists in any capacity up to ten tons, switches and various kinds of tracking for factories, barns, etc., manufactured by them, they are undertaking the manufacture of parlor and barn door rollers, fire door rollers and babbit metals and solder, also a line of hardware specialties.

Electric Crane Transporters.

To facilitate the loading and discharging of ships' cargoes, two machines worked by electricity, will be introduced on the Montreal wharves when the shipping season commences. It is claimed that they will do twice as much work as cranes and, if this is so, it will be no uncommon occurrence this summer to get a boat loaded or unloaded within a few hours. F. W. Cowie, harbor engineer, is the inventor of this patent contrivance. It consists of a car and a network of machinery which supports two long arms, one of which will stretch over the hatchway of a ship while the other will reach to the centre of a cargo shed.

Each arm will be 45 feet in length and made capable of sustaining a weight of two tons. The transporter can be worked by one man who will simply have to manipulate a handle to set it in motion. An iron chain will descend from the arm over the ship, and to this will be fastened goods in the hold which, through the electrical power, will run along one arm to the other and drop in the shed. The transporter, the car of which is as broad as the railway tracks at the wharf, will run on four wheels on the railway lines. It can therefore be moved to any part of the harbor within a very short time. The C.P.R. and the Allan Steamship Company will each give a trial to the transporter this summer, and Mr. Cowie expects that the installation of the labor and time-saving machines will prove beneficial in every way to the shipping interests of the port. No charge excepting that for electrical power, will be made against the two aforesaid companies this year, but if the transporters prove that they are much quicker exporting and importing machines than cranes or other contrivances, additional ones will be built for sale next year.

Canadian Machine Tool Markets

THE METAL SITUATION.

Orders have been swinging in freely during the month, and for the most part a bright tone has been manifested in the markets. The unseasonable weather, and the slight feeling of apprehension in some quarters as to the welfare of the crops, seemed to damp consumers a little towards the end of the month, with the result that the situation became not quite so buoyant. The metal markets are easily influenced just at present, however, and while it does not take much to depress the tone, it does not take much to elevate it, and bright reports as to general trading conditions would soon put matters tight. Of course the weak tendency of the primary markets are all against a healthy position.

Tin has been fluctuating all the way through with little character to the buying. Copper made a speculative jump in London but fell away again. Spelter has been uniformly steady, and lead on the weak side. The bright feature has been the improvement in the United States iron and steel markets. Heavy tonnage was booked during the month, while prices firmed up. Bars, plates and shapes went back to the prices first made on the February reduction, while some of the pig iron interests advanced prices 25c. a ton and more.

In Canada all metals have been in demand, and prices have ruled fairly firm. Heavy consignments are entering the port of Montreal, and the stuff cannot be distributed fast enough to please customers which shows how low stocks are. There has been a very strong demand for galvanized sheets. The inquiry for tin and copper has been very good, and it is evident that with stronger primary markets a much heavier consuming demand would be tempted into the markets. The jobbing price of tin has been maintained steadily at 32½c. copper at 14c., spelter at $5.50 to $5.75 and lead at $3.65. Buying ahead has improved in pig iron and users are paying somewhat heavier prices for deliveries extending to the fall. With several Canadian furnaces out of the open market, owing to their steel orders, the situation is much stronger. The remaining furnaces are well occupied, and price have a higher tendency.

MONTREAL.

There is a decidedly better tone to the machine tool market. It is true that the large consumers are still disinclined to purchase with their old time freedom, although in this respect a welcome change seems to be coming, as one or two large orders have been placed this month, but the smaller shops are well to the fore, and are buying freely, if in small bulk. As one supply house said, trade wants plenty of hustling after, but the small orders aggregate a steadily increasing volume, and the big orders must come soon. Even the railroads are losing their cautious attitude, which is a good sign of the times.

With trade improving the markets are naturally firm for all class of tools. American lines are very steady, and have been for many months, while Canadian makes are getting firmer in price. Some home lines have advanced and the prospects point towards a further advance. Makers are steadily producing, and stocks generally are in good shape and able to cope with a strong consuming demand. At present Montreal seems to be supplying the bulk of orders, but other points in the Province of Quebec and in the Maritime Provinces are showing a welcomed improvement.

TORONTO.

The outlook for business at the present time is excellent as industries are upon a permanent basis and far more likely to expand than contract their operations and also because there is a general tendency among the managers of mines, smelters and mills to substitute new, improved and larger machinery for that installed in the various plants in the initial stages.

In spite of comparative inactivity in some mining centres and of the effect on sawmills of the uncertainty as to the immediate prospects of the lumber industry, the demand for new machinery and for repairs and improvements has been greater and more regular during the winter closing than in any preceding season since establishment.

One manufacturer of boilers has sold return tubular and portable boilers aggregating over 4,000 horse power since the first of the year. A number of these were shipped to British Columbia.

Quantities of heavy tools for both metal and wood working have been shipped to the west recently. H. W. Petrie shipped several carloads to Vancouver recently. A great number were to fill orders and the rest for the showrooms in Vancouver.

WINNIPEG.

Winnipeg is not very forward in the list of Canadian manufacturing cities. It is well known in western Canada as a gigantic distributing station for almost all manufactured goods. And in the machine line there is keen competition among Canadian manufacturers to land their goods on the western market.

As a consequence of the limited number of manufacturing concerns, the small tool market is usually very quiet, particularly in the steel tool line. The wood-working tools are increasing in demand and recently there has been an advance in prices ranging from 10 to 15 p.c.

There has been a noted expansion in the heavy tool market of late. Milling machinery is much in demand in various parts of the west, and local supply houses are busy sending out heavy tool specialties.

W. A. McLeod, manager and director of the western branch of the Stuart Machinery Co., leaves for the east in a few days to investigate the machinery market of the leading American and Canadian cities. He will visit Chicago, New York, Buffalo, Montreal, Toronto and Galt. The last named city is the home of the firm he represents.

The annual meeting of the Western Iron Works Co. was held here on May 10, at which

meeting new officers were elected and financial reports read. C. M. Simpson was elected president in succession to C. A. Baskerville, who resigned to become a director. David Trainer is vice-president and manager, and Alexander Simmers, treasurer.

The reports submitted by H. R. Eade, secretary, were exceedingly gratifying to the Board of Directors. The company one year ago did not anticipate the large volume of business that has been done during the year.

The secretary of the Board of Control of Winnipeg is calling for tenders for the supply to the Point Du Bois Hydro-Electric plant of soft copper plate of No. 16 Birmingham gauge. There are 2,700 pieces to be supplied. 1,350 pieces are to be 24'' by 36'' plain, and the remainder 4'' by 6'' each punched with two 11-16 inch holes.

The Manitoba Iron Works Co. are erecting a new structural steel and bridge building plant on their premises in this city. The building will be the second largest in Canada being superceded by the Dominion Bridge Company, Montreal. The plant will be 412 feet by 140 feet containing works and office. The front will have a double set of offices, one above for drafting and the one below devoted to business.

The building will be equipped with new machinery from the Pittsburg Construction Co., including two electric cranes of 15 tons capacity each, and several smaller cranes.

All the power used will be electrical, and it is estimated that the total cost of building and equipment will be $120,000.

The present plant is devoted to the manufacture of elevator machinery, and general foundry work with a capacity of 15,000 tons of structural steel per year and 10,000 tons of cast steel.

With the additional works the number of men employed will be increased from 250 to 500.

Among recent orders placed with the company are, 4,500 tons of structural steel for the new G.T.P. shops, and 1,200 tons of steel transmission towers for the city power plant. L. C. H.

VANCOUVER.

It is a good time of year anyway, and the prospects are particularly good just now. There is greater movement than at any time previously. Building continues active, the permits being nearly all for dwelling houses, railway construction is going on close to the city, logging is starting up, and, in short, the situation all through, is encouraging.

A large amount of work is to be done by the B. C. Electric Railway Company in the city and suburban districts, which will total an expenditure of about $2,000,000.

H. W. Petrie has brought to Vancouver several carloads of machine tools most of them for immediate delivery and the rest for stock in his warehouse here.

CATALOGUES.

BRIDGES—150 page catalogue on bond paper from the Hamilton Bridge Works Co., Hamilton. It is well prepared and well printed. Photographs are given, showing their large works in Hamilton and a large number of bridges erected by them in various parts of Canada illustrating the several types.

INDUCTION MOTORS—Bulletin 102 from the Packard Electric Co., St. Catharines, Ont., describing in detail with illustrations their induction motors and oil-immersed auto starters.

CUPOLAS—Catalogue from the Knoeppel Co., 577 East Ferry St., Buffalo, entitled "Maximum cupola efficiency made possible by the Knoeppel continuous tuyerage system." The description is very complete and contains a number of illustrations.

VISES—From Hollands Mfg. Co., Erie, Pa., a handsome catalogue of machinists' tools printed on bond paper with embossed cover. Descriptions, illustrations and prices are given of the various vises, swivel jaw, solid jaw, parallel, filers, offset jaw, woodworkers', combination pipe, chipping and pipe vises, as well as pipe cutters, taps and dies, etc.

CALENDARS—The Stephenson Mfg. Co., Albany, New York, are issuing a handsome set of twelve calendars. By sending a postal with name and address the writer will receive the series of pretty girl calendars. Above the calendar of each calendar is the portrait of a pretty girl. The design is very attractive.

David Reid, of the Reid Foundry & Machine Co., Ingersoll has been appointed superintendent of the Berg Machinery Co's foundry, Toronto. In addition to the Berg brick machinery they will manufacture engines, Reid molding machines and carry on a general foundry jobbing business.

Manufacture of Carborundum Grinding Wheels

The History of Carborundum, its Discovery, and a Description of the Process of Securing the Crystals that make Carborundum Grinding Wheels.

The word grinding when referring to carborundum is used in its popular rather than in its strict meaning. Carborundum cuts, its action being like the lathe or planer tool rather than the rubbing brick or file. This is due to the fact that carborundum is made up of the microscopic sharp-edged crystals, which break and split into smaller crystals when brought into contact with a piece of metal under heavy pressure. Each new crystal has new sharp cutting edges and thus a constantly fresh, sharp-cutting surface is maintained.

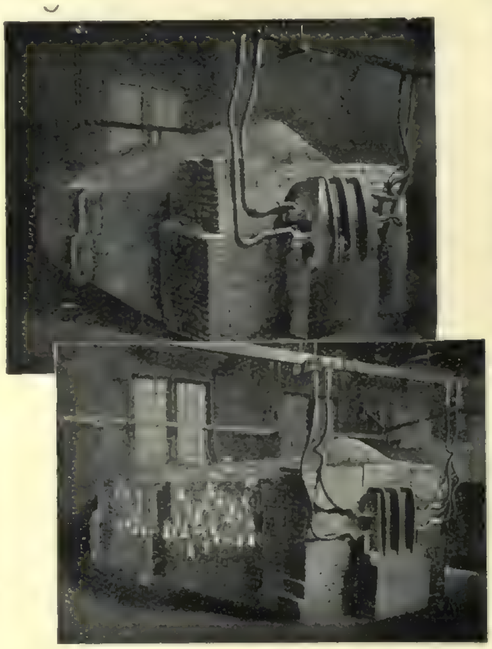


Fig. 1.—The Furnaces.

Carborundum is about fifteen years old, it being in 1893 that Edward Goodrich Acheson located in a little shop at Monongahela City, Pa., discovered the product.

Mr. Acheson was experimenting with an electric current, some clay and some coke, when he made his wonderful discovery. The clay and the coke he put in a small iron pot or bowl, such as plumbers use. Into this mixture he stuck a carbon rod from which a connection was made to one pole of a dynamo. The current was turned on and the clay and the coke became a molten mass. When the carbon rod was withdrawn from the bowl, the trained eye of Mr. Acheson discovered some minute crystals adhering to it. These crystals were found to be so hard, so sharp and so beautifully tinted that for a time the discover thought that at last a man-made diamond was possible.

The new crystals, however, lacked the transparency of the diamond, but so far as hardness and sharpness were concerned, were equal to the nature product. Just what they were the inventor or, rather, discoverer, really did not know. He collected enough of the new crystals, from other experiments, to fill a small vial, and these he took to the gem experts in New York.

The experts were, after some persuasion, induced to test the abrasive powers of the new crystals on some precious stones. The results were startlingly successful, and Mr. Acheson got his first order for the new product, which he called "Carborundum," at 40 cents a carat. He then went back to "the little shop" to make carborundum by the pound instead of the ounce or carat.

To-day the down-to-date farmer sharpens his scythe with these near diamonds, but of course not at the first jewelers' prices. The improvements in the process of manufacture, the subsequent creation of a demand for the product, which so rapidly took the place of the natural abrasives, all tended to lower the cost of production and thus bring down the market price.

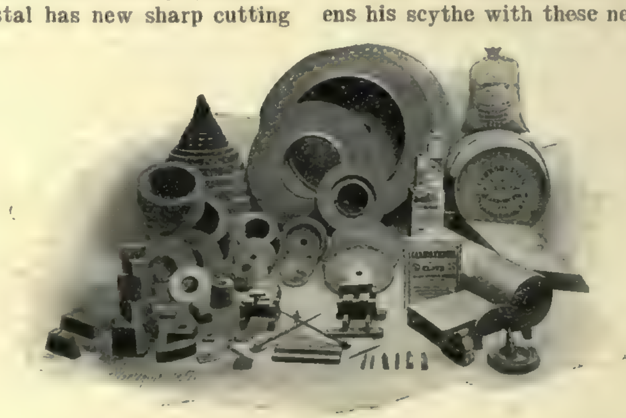


Fig. 2.—The Finished Products.

Beath's Overhead Carrying Systems

A Great Money-Saving Convenience for Use in

Foundries, Factories, Warehouses, etc.

Showing a portion of Tracks and Carrier installed in 1905 for the American Chicle Co., Toronto, Ontario. The illustration shows Chain-block Hoist attached to quadruple Carrier with Automatic Dumping Sling for handling bags of Chicle.

The following letters—a few out of many scores of similar letters that we have on file—will give you some idea of the convenience and economy effected by our Overhead Carrying Systems. Note the various classes of work on which Beath Overhead Carrying System is saving the users money. No two systems are alike, each being designed to meet the requirements of the particular case. What we have accomplished for these firms we can accomplish for you. Read the letters:

Machine Shop

The Beath Overhead Carrying System was installed in our plant about two years ago and has led to a considerable saving in labor charges, with increased facility in handling our raw material and finished products. The system once installed is comparatively cheap to maintain, and requires little trouble to operate. We consider the overhead system has advantages over surface track for average loads.

BELLEVILLE IRON & HORSESHOE CO., LIMITED

Foundry

Replying to your letter of the 10th inst. we would say that the Overhead Trolley supplied by you for use in our foundry has proven most satisfactory and has resulted in the saving of a great amount of labor in the carrying of molten iron from the cupola to the more distant floors. You may recall that after having a part of the present system in use for a short time we found it so valuable that we extended it to the utmost limit.

We have in view the installation of some other overhead tracks and when we have fully decided about the matter we shall ask you to give us a price on what we shall require.

J. FLEURY'S SONS, Aurora

Factory

We have installed the Beath Overhead Carrying System in our factory and find it saves a great deal of labor. It is giving excellent satisfaction. We wonder now how we got along without it. 1,200 feet Track, 14 Switches, 10 Carriers.

THE AMERICAN CHICLE CO.
J. PHYN, Manager

Warehouse

We wish to advise you that the Overhead Carrier System which you installed in our new factory, for the conveyance of Chicle from the warehouse to railway cars on our private siding and from the cars into the warehouse, has proven itself to be the time and money saver which we anticipated. We also find the scale attachment of great value as it not only saves handling of goods, but gives the correct weight without the loss of time.

The whole system is most complete and satisfactory and we will be pleased to recommend it to any firm wishing to have their factory equipped in a thoroughly up-to-date manner.

FRANK H. FLEER & CO., INC.

Brewery

The Electric Carrier which you installed in our Brewery about a year ago has given every satisfaction.

As a *Labor Saver* in the work it has to do in the distribution of casks to our different vaults it easily saves one half; and, furthermore, we would not now be without one. Anyone requiring a carrier for above work, we can highly recommend your make.

THE COSGRAVE BREWERY CO.
OF TORONTO, LIMITED
JAMES COSGRAVE, Secretary

WRITE US TO-DAY FOR ILLUSTRATED CATALOG

W. D. BEATH & SON, 193-5 TERAULEY STREET Toronto, Ont.

Its Manufacture.

To-day at the Carborundum Company, at Niagara Falls, there are twenty-four mammoth furnaces which yield 7,500,000 pounds of carborundum a year instead of one little bowl and rod furnace which fifteen years ago gave an ounce or so of this remarkable abrasive to the world.

The process of manufacturing carborundum to-day is practically the same as it was fifteen years ago, only that everything is done with greatly improved methods and on a greatly enlarged scale.

This mixture is placed in a big rectangular brick and iron furnace in great grave-like mounds. At each end of the furnaces four heavy cables are attached, these cables connecting directly with a core of crushed coke running through the bottom of the furnace bed. These cables carry 1200 horse power of electricity generated by the waters of Niagara Falls. For thirty-six hours this tremendous power is shot into the furnace and it generates heat which has never been accurately registered, as there is yet to be invented an instrument which will withstand this heat long enough to make an actual record.

The Crystals.

At the end of thirty-six hours, the sides of the furnace are taken down and the thick, black, ugly coating is removed. Like the most humble of Portia's caskets, this ugly covering hides the jewels, for the crystal masses reflect, accentuates and glorify the radiance of gems. Now purples, now greens, now azures and golden tints are discovered in almost every crystal mass—colors which the cleverest artist would despair of truthfully reproducing.

These crystal masses are taken from the furnaces and broken and crushed to the individual crystals, beneath immense steel wheels. The grits or powders thus secured are washed and then graded and graduated by screening through silk screens of different meshes.

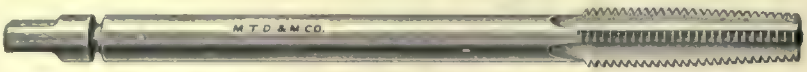
A goodly portion of this powder is made up into scythe stones, combination stones for the carpenter and mechanic, razor hones for the home shaver and the barber, knife sharpeners for the housewife, and the many slips, rubbing blocks and special sharpening stones for the different trades, but no matter how fine or how coarse a carborundum stone is, it always has the same most wonderful cutting properties.

These stones after being fashioned under hydraulic presses to the different shapes, are placed in immense kilns like those used by the potters and vitrified at a heat estimated at 2,500 degrees. This is the last step in the making of the wheels and stones, save the minute inspection and testing by experts.

"MORSE" TAPPER TAPS

as illustrated are specially adapted for use in single and multiple tapping machines. Designed and tempered for use in hot pressed or rough iron nuts. We carry in stock regular tapper taps with blank ends from ¼ inch to 1½ inch in lengths of 11, 12, 14 and 15 inches.

Prices on application for special shanks.



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The Morse Twist Drill & Machine Co.

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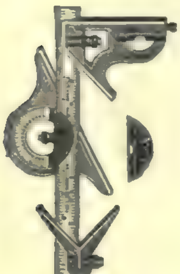

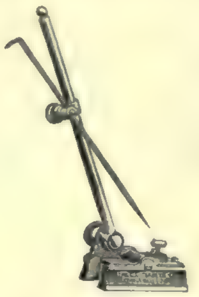

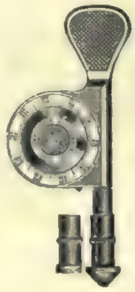

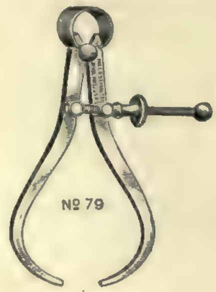

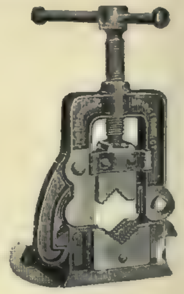

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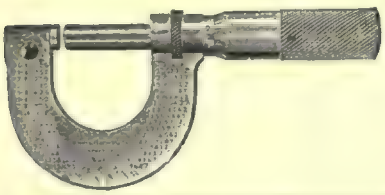

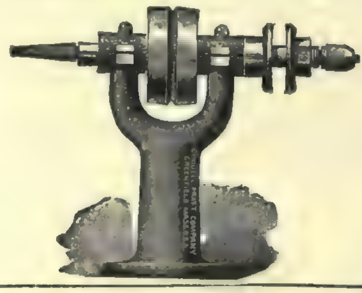

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If so, write for our book No. 11-D and learn how iron and steel may be livened up and purified in ladle and crucible. It is a book that every foundryman should have and will be mailed to you for the asking.

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Skinner Chuck Co., New Britain Conn
Standard Tool Co., Cleveland.

Chucks, Grinding Machine.
E Horton & Son Co., Windsor Locks, Conn
Skinner Chuck Co., New Britain, Conn

Chucks, Independent Jaw.
Aikenhead Hardware, Ltd., Toronto
E Horton & Son Co., Windsor Locks, Conn.
Skinner Chuck Co., New Britain, Conn

Chucks (Planer or Milling.)
Gardner, Robt. & Son, Montreal
E Horton & Son Co, Windsor Locks, Conn
Skinner Chuck Co, New Britain, Con

Chucks, Screw Machine.
E Horton & Son Co, Windsor Locks Conn
Skinner Chuck Co. New Britain, Conn

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Jeffrey Mfg. Co., Montreal

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Goldie & McCulloch Co., Galt.
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Waterous Engine Co., Brantford.

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T. Pringle & Son, Montreal.

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Dodge Mfg. Co., Toronto
Goldie & McCulloch Co., Galt
Jeffrey Mfg Co., Montreal
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Hamilton Facing Mill Co., Hamilton

Core Compounds.
Detroit Foundry Supply Co., Windsor.
Dominion Foundry Supply Co, Toronto
Hamilton Facing Mill Co., Hamilton.
Millers' Products Co., Chicago, Ill.
H. E. Mills Mfg Co, Syracuse, N.Y.
Stevens, F. B., Detroit, Mich.

Core-Making Machines.
Brown Specialty Machinery Co., Chicago, Ill.
Falls Rivet & Machine Co., Cuyahoga Falls, Ohio.
Hamilton Facing Mill Co., Hamilton.
Stevens, F. B., Detroit, Mich.

Core Ovens.
Calumet Eng. Works, Harvey Ill.
Detroit Foundry Supply Co., Windsor.
Dominion Foundry Supply Co., Montreal
Falls Rivet & Machine Co., Cuyahoga Falls, Ohio.
Hamilton Facing Mill Co., Hamilton and Montreal.
Sheldons Limited, Galt
Stevens, F. B., Detroit, Mich.
Whiting Foundry Equipment Co., Harvey, Ill.

Core Prints—Standard.
Falls Rivet & Machine Co., Cuyahoga Falls, Ohio.
Hamilton Facing Mill Co., Hamilton.

Core Sand Cleaners.
Sly, W. W., Mfg. Co., Cleveland

Core Wash.
H. E. Mills Mfg Co, Syracuse, N.Y.

Counterbores.
Cleveland Twist Drill Co, Cleveland

Countersinks.
Cleveland Twist Drill Co., Cleveland

Couplings.
Dodge Mfg. Co, Toronto
Gardner Robt. & Son. Montreal
Owen Sound Iron Works Co., Owen Sound
Wilson, J. C., & Co., Glenora, Ont.

Couplings, Air.
Canadian Rand Co., Montreal.
Independent Pneumatic Tool Co., Chicago

Cranes, Electric and Hand Power.
Advance Machine Works Walkerville.
Calumet Eng. Works, Harvey, Ill.
Canadian Rand Co., Montreal.
Dominion Foundry Supply Co., Montreal
Gardner, Robt & Son, Montreal
Hamilton Facing Mill Co., Hamilton.
Milroy-Harrison Co., Toronto
Mussens Limited, Montreal.
Niles-Bement-Pond Co., New York.
Northern Engineering Works, Detroit
Owen Sound Iron Works Co, Owen Sound
Smart-Turner-Machine Co., Hamilton.
Whiting Foundry Equipment Co., Harvey, Ill.

Cranes, Hydraulic.
Calumet Eng. Works, Harvey, Ill.
Whiting Foundry Equipment Co., Harvey, Ill.

Crank Pin Turning Machine.
London Mach. Tool Co., Hamilton.
Niles-Bement-Pond Co., New York.

Crossings, Diamond Rail
Montreal Steel Works, Montreal

Crucibles.
Bartley, Jonathan, Crucible Co., Trenton, N.J.
Detroit Foundry Supply Co., Windsor
Dominion Foundry Supply Co., Montreal
Goldschmidt Thermit Co., Toronto
Hamilton Facing Mill Co., Hamilton.
Siedel, R. B., Inc., Philadelphia
Stevens, F. B., Detroit, Mich.

Crushers, Rock or Ore.
Jeffrey Mfg. Co., Montreal
Waterous Engine Works Co., Brantford.

Cupolas.
Advance Machine Works, Walkerville.
Calumet Eng. Works, Harvey, Ill.
Detroit Foundry Supply Co., Windsor
Dominion Foundry Supply Co., Montreal
Hamilton Facing Mill Co., Hamilton.
Northern Engineering Works, Detroit
Sheldons Limited, Galt.
Whiting Foundry Equipment Co. Harvey, Ill.

Cupola Blast Gauges.
Dominion Foundry Supply Co., Montreal
Hamilton Facing Mill Co., Hamilton.
Sheldons Limited, Galt

Cupola Blocks.
Detroit Foundry Supply Co., Detroit.
Dominion Foundry Supply Co., Toronto
Hamilton Facing Mill Co., Hamilton
Northern Engineering Works, Detroit
Ontario Lime Association, Toronto

Cupola Blowers.
Detroit Foundry Supply Co., Windsor
Dominion Foundry Supply Co, Toronto
Hamilton Facing Mill Co., Hamilton.
Northern Engineering Works, Detroit
Sheldon's Limited, Galt

Cupola Linings.
Hamilton Facing Mill Co, Hamilton.
Stevens, F. B., Detroit, Mich.

Cupalo Twyers.
Knoeppel Co., Buffalo, N.Y.

Cutters, Flue.
Independent Pneumatic Tool Co., Chicago, Ill.

Cutters, Gear.
Aikenhead Hardware, Ltd, Toronto
Milroy Co., Toronto

Cutters, Pipe.
Aikenhead Hardware, Ltd., Toronto
Hollands Mfg. Co., Erie, Pa.
A. B. Jardine & Co, Hespeler, Ont.
Trimont Mfg Co., Roxbury, Mass.

Cutter Grinder Attachment
Cincinnati Milling Machine Co., Cincinnati

Cutter Grinders.
Cincinnati Milling Machine Co., Cincinnati

Cutters, Milling.
Abbott, Wm, Montreal
Becker Milling Machine Co, Hyde Park Mass.
Cleveland Twist Drill Co., Cleveland
Hamilton Tool Co., Hamilton, Ont.
Milroy Co., Toronto
Mussens Limited, Montreal.
Pratt & Whitney Co., Hartford, Conn.
Standard Tool Co., Cleveland.

Cutting-off Machines.
Armstrong Bros., Tool Co., Chicago
John Bertram & Sons Co., Dundas, Ont.
London Mach. Tool Co., Hamilton.
Mussens Limited, Montreal.
H. W. Petrie, Toronto.
Pratt & Whitney Co., Hartford, Conn.

Cutting-off Tools.
Armstrong Bros. Tool Co., Chicago.
London Mach. Tool Co., Hamilton.
H. W. Petrie, Toronto.
Pratt & Whitney, Hartford, Conn.
L. S. Starrett Co., Athol, Mass.

Damper Regulators.
Darling Bros., Ltd., Montreal

Dies.
Aikenhead Hardware, Ltd., Toronto
Armstrong Bros., Toronto
Banfield, W. H. & Son, Toronto
Bliss, E. W., Co., Brooklyn, N.Y.
Fisher, A. D., Co., Toronto
Gardner, Robt. & Son, Montreal
Hollands Mfg Co, Erie, Pa.
Scott, Ernest, Montreal.

Die Stocks.
Aikenhead Hardware. Ltd, Toronto
Curtis & Curtis Co., Bridgeport, Conn.
Jardine, A. B., & Co, Hespeler, Ont.
Milroy Co., Toronto

Dies, Opening.
W. H. Banfield & Sons, Toronto
Jardine, A. B., & Co., Hespeler, Ont.
Pratt & Whitney Co., Hartford Conn.

Dies, Threading.
Aikenhead Hardware, Ltd., Toronto
Jardine, A. B., & Co., Hespeler, Ont.
Milroy Co., Toronto

Draft, Mechanical.
W. H. Banfield & Sons, Toronto.
Butterfield & Co, Rock Island, Que.
A. B. Jardine & Co., Hespeler
Pratt & Whitney Co., Hartford, Conn.
Sheldon's Limited, Galt.

Drilling Machines, Horizontal.
John Bertram & Sons Co., Dundas, Ont.
Kellogg & Co., Toronto
London Mach. Tool Co., Hamilton.
J. J. McCabe, New York City, N.Y.
Mussens Limited Montreal
Niles-Bement-Pond Co., New York.

Drilling Machines, Locomotive.
American Tool Works Co., Cincinnati.
John Bertram & Sons Co., Dundas, Ont.
Kellogg & Co, Toronto
The Canadian Fairbanks Co., Montreal.
A. B. Jardine & Co., Hespeler, Ont.
London Mach. Tool Co., Hamilton, Ont.
Mussens Limited, Montreal.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.

Drilling Machines, Multiple Spindle.
American Tool Works Co., Cincinnati.
John Bertram & Sons Co., Dundas, Ont.
Kellogg & Co, Toronto
London Mach. Tool Co., Hamilton, Ont.
Mussens Limited. Montreal.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.

Drilling Machines, Radial.
American Tool Works Co, Cincinnati.
The Canadian Fairbanks Co., Montreal.
Kellogg & Co., Toronto
London Mach. Tool Co., Hamilton.
MacGregor, Gourlay Co., Galt
Mussens Limited, Montreal.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.

Drilling Machines, Turret.
John Bertram & Sons Co. Dundas, Ont
London Mach. Tool Co., Hamilton.
Niles-Bement-Pond Co., New York.

Drilling Machines, Upright.
American Tool Works Co., Cincinnati.
Bawden Machine & Tool Co., Toronto.
John Bertram & Sons Co., Dundas, Ont.
Fox Machine Co, Grand Rapids.
Hamilton Tool Co., Hamilton, Ont.
A. B. Jardine & Co., Hespeler, Ont.
Kellogg & Co., Toronto
London Mach. Tool Co., Hamilton.
MacGregor, Gourlay Co., Galt
J. J. McCabe. New York City N.Y.
Mussens Limited, Montreal.

Drills, Bench.
Fisher, A. D., Co., Toronto
Hamilton Tool Co, Hamilton, Ont.
Kellogg & Co., Toronto
London Mach. Tool Co., Hamilton.
Pratt & Whitney Co., Hartford, Conn.

Drills, Bit Stock.
Cleveland Twist Drill Co., Cleveland

Drills, Blacksmith.
Aikenhead Hardware, Ltd., Toronto
American Specialty Co., Chicago
Cleveland Twist Drill Co, Cleveland
A. B. Jardine & Co., Hespeler, Ont.
Kellogg & Co., Toronto
London Mach. Tool Co., Hamilton.
Standard Tool Co., Cleveland.

Drills, Centre.
Aikenhead Hardware, Ltd. Toronto
Cleveland Twist Drill Co., Cleveland
Milroy Co., Toronto
Pratt & Whitney Co., Hartford, Conn.
Standard Tool Co., Cleveland, O.
L. S. Starrett Co., Athol, Mass.

Drills, Coal and Plaster.
Cumming, J. W., New Glasgow, N.S.

Drills, Electric.
Cincinnati Electrical Tool Co., Cincinnati
Fisher A. D., Co., Toronto
Mussens Limited, Montreal.
Niles-Bement-Pond Co., New York.

Drills, High Speed.
Aikenhead Hardware, Ltd, Toronto
American Specialty Co, Chicago
Abbott, Wm., Montreal
Hermann Boker & Co., Montreal
Cleveland Twist Drill Co, Cleveland
Alexander Gibb Montreal.
Lincoln-Williams Twist Drill Co, Taunton Mass.
J. J. McCabe, New York City, N.Y.
Milroy Co., Toronto
Mussens Limited, Montreal.
Pratt & Whitney Co., Hartford, Conn.
Standard Tool Co., Cleveland, O.

Drills, Hand.
A. B. Jardine & Co., Hespeler, Ont.

Drills, Oil Tube.
Cleveland Twist Drill Co., Cleveland

Drills, Pneumatic.
Allen, John F., New York
Canadian Rand Co., Montreal
Independent Pneumatic Tool Co., Chicago, New York
Mussens Limited, Montreal.
Niles-Bement-Pond Co., New York.

Drills, Portable Electric.
Cincinnati Electrical Tool Co., Cincinnati

Drills, Ratchet.
Aikenhead Hardware. Ltd, Toronto
Armstrong Bros. Tool Co, Chicago.
Cleveland Twist Drill Co., Cleveland
A. B. Jardine & Co., Hespeler,
Milroy Co., Toronto
Pratt & Whitney Co., Hartford, Conn.
Standard Tool Co., Cleveland.

Drills, Rock.
Canadian Rand Drill Co., Montreal.
Jeffrey Mfg Co., Montreal

Drills, Sensitive.
American Tool Works Co., Cincinnati.
Fisher, A. D., Co., Toronto
Fox Machine Co., Grand Rapids.
Kellogg & Co., Toronto
McKenzie, D., Guelph, Ont.
Mussens Limited, Montreal.
Niles-Bement-Pond Co., New York

Drills, Track.
American Specialty Co, Chicago
Cleveland Twist Drill Co, Cleveland

Drills, Twist.
Aikenhead Hardware, Ltd, Toronto
American Specialty Co., Chicago
Abbott, Wm., Montreal.
Hermann Boker & Co., Montreal
Cleveland Twist Drill Co., Cleveland
Alex. Gibb, Montreal.
Lincoln-Williams Twist Drill Co., Taunton, Mass.
Milroy Co, Toronto

Cylindrical Grinding, Dealing With Finishing Methods*

A Practical Article Showing Advantages, giving Description of Machines Used and Method for Obtaining Best Economy in Cylindrical Grinding.

By C. H. NORTON

It is probably true that there is more misunderstanding among workmen in regard to cylindrical grinding than in the case of any of the other mechanical arts. Nearly every operator has a different theory; and each maker of grinding machines has his own method of grinding. There is confusion of ideas which can be cleared up by pursuing the investigation to the end. Do not take anything for granted. When you shall come to consider the commercial side of cylindrical grinding, no doubt the first argument you meet will be this one, which is brought forward very often by those who have not pursued the subject to the end. The argument is that "it cannot be possible that metal can be as economically removed by a grinding wheel with delicate, microscopic cutting points as with a massive steel tool. Metal ground into powder cannot be as economically removed as with a tool that cuts off great chips."

Time for Finishing by Grinding.

A shaft 6½ in. diameter, 10ft. long, rough-turned cheaply to within about 1-32 in. of the required finish size, can be finished straight, round to a limit of 0.0005 in. plus or minus by the grinding method, with a modern grinding machine, in from one to two hours according to the ambition of the operator. Here is a case where the cutting of the material to a powder with microscopic cutting points is very economical.

To be sure, the cutting points of the grinding wheel are small, but in this case there are approximately 1,086,171 cutting points, that cut 1000 times per minute, making approximately 1,086,171,000 chips per minute.

The statement that it requires enormous power to grind steel to a powder, while cutting it into larger chips does not, should have careful thought. In the case of the 10 ft. bar we use an average of approximately 8 H.P. from 1½ to 2 hours when grinding the finish cut. The production of a good grade of work when removing 1-32 in. more or less, shows a great economy by the grinding method. When, however, the surface can be rough and the diameter may vary within certain limits, a steel tool cutting deeply will remove the same amount of metal in shorter time. If the object is simply to remove a certain number of pounds of metal, turning it off with a steel tool is cheapest. As we know, nearly all round work must have an accurate, or approximately accurate, diameter, and from an approximately smooth to a very smooth surface. The great majority of round work must finally have a good surface and accurate dimensions and for this the grinding method is very economical.

Cost of Grinding.

There are some cases where grinding can be used economically. A case that illustrates this is that of bridge pins which are from 12 ins. to 8 ft. long and from 3 to 18 ins. diameter. Grinding is accomplished by a number of rapid cuts and during the final or light cuts, the grinding wheel does not wear at all, so that work is produced of uniform diameter regardless of length. Work may be ground up to 22 ft. long to a limit of 0.0005 plus or minus.

While practically all round work is turned before grinding, there is a portion of such work that is most economically ground without turning. Owing to certain shapes, or structural weakness, it sometimes becomes difficult to turn. An extreme case of this kind is that of a shaft, or bar of steel, 9-16 in. diameter and 10 ft. long, with 1-16 in. to be removed from the diameter to produce an accurate ½ in. bar within a limit of 0.0005 in. plus or minus. It is easy to understand how difficult it would be to turn this bar. We, however, find it very easy to grind such a bar to the limits, and in short time. The roughing cuts that take the place of the turning easily remove the stock to within a few thousandths in about ten minutes, while hours would be consumed in turning such a bar to even coarse limits.

Grinding Slender Work.

We are enabled to grind the pins and short bearings of automobiles accurately, direct from the drop forging, and we secure excellent work. The long, frail crankshafts for agricultural machines are also very rapidly and accurately ground. Many of these shafts are 7 ft. long by 1⅝ in. diameter of stock, with bearings and pins reduced to 1 5-16 in. diameter. We find it most economical to grind all short bearings and pins without turning, while we find it best first to turn the long part at one end, grinding it afterwards.

In the case of slender work that springs badly when it is turned, we can many times grind the same work more quickly than it can be turned and ground; because, when grinding off the material, the spring is ground out as it occurs, owing to the many cuts or passes of the grinding wheel; while, when it is turned, with one cut over, it must be straightened before the finishing cut is taken. It is true, however, that the majority of work should be turned before grinding. I have been quoted as saying that we "grind without turning." I never said so. I did say, as I have done here, that sometimes we grind without turning, but usually we do not.

Poole Form of Cylindrical Grinding Machine.

The earlier attempts at cylindrical grinding were made by mounting grinding wheels on the carriages of engine lathes. This was thirty years ago but does not secure the most perfect work. Mr. J. Morton Poole, of Wilmington, Delaware, discovered that it was impossible to secure perfect cylinders by grinding wheels on engine lathes, and, as a result of his study of the problem, the J. Morton Poole grinding machine was invented in the year 1867.

Mr. Poole's invention was unique in that it enabled him to grind rolls of perfectly uniform diameter from end to end, regardless of the imperfections of the traversing carriage ways. His invention came at a time when the art of scraping to master plates, and master straight-edges, was practically unknown, and when mechanics had little if any idea that such perfection could be obtained, much less maintained for any considerable time; also when few could appreciate the results he obtained. The Poole machine, however, depends for success upon the use of two grinding wheels, one on either side of the work; it has therefore, limited application. It has always been used for roll grinding.

The modern grinding machine has ways that secure perfect work with a single wheel, thus giving the machine a wide field, covering all work that revolves on its axis, whether rolls, small or large, shafts, spindles, piston rods,

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* Extract of lecture prepared for mechanical engineering class, Columbia University.

work long or short, large or small, and having one single diameter, or many sizes, on the same piece. The Poole machine gave accuracy. The modern machine, if rightly constructed, gives both accuracy and large production. Having but one wheel, and being open toward the operator, it is conveniently operated, and work is quickly placed or removed. I make this comparison not to depreciate the Poole machine, for I consider it one of the most important inventions in the development of the art. I wish, however, to have you realize that the development of the art of scraping and straight-edge making has made possible the use of very massive, long grinding ways that are really straight, and will remain straight for years. Such a thing was unknown when Mr. Poole made his very valuable and original invention to obtain perfect cylinders without perfect guiding ways.

One of the most important facts in connection with cylindrical grinding for the young engineer to get clear in his mind is that all perfection in this world is relative, and that this is most certainly true of cylindrical grinding. This being true, to what in the mechanical world should he turn to fix the relation when deciding upon the quality of cylindrical grinding for the various uses it is inteded? Why, most certainly to the lathe; because the grinding machine is no more and no less than a grinding lathe. Now, if its product is an improvement on the product of the ordinary lathe, then it has proved its right to the field. The lathe was never a polishing and buffing machine; neither was it a lapping machine. We used its centres and spindle on which to revolve work while we filed and polished or lapped it; but there was nothing about the lathe that contributed in any way to the quality of the filing, lapping, or polishing; that was a matter of hand-work entirely. Therefore, when we wish to judge as to the merits of grinding, we must compare it with turning alone, not with turning, filing, and lapping.

Now, if we can with the grinding machine take the finishing cut of the lathe in less time than the lathe, and at the same time produce a better surface and nearer absolute cylindrical perfection, then are we warranted in adopting the grinding machine in place of the lathe for all finishing cuts or sizing operations. If occasionally we require an absolutely perfect cylinder, we must lap it in addition; and a grinding machine, if well designed and constructed, is a perfect lapping machine also. We should not, however, expect perfect lapped work from any grinding wheel. We can, by taking time enough produce a polished surface with a grinding wheel, but the same time spent with a genuine lapping wheel would produce more perfect work. Glossy surface by grinding wheels means imperfect cylinders. We can secure the closest approach to perfection by the use of grinding wheels that cut without perceptible pressure; thus they must be soft or free-cutting, and therefore produce a surface without much gloss. He who desires really round work with uniformly distributed contact over its entire area should use free-cutting wheels of broad face; and the truest work will show, not a bright, glossy surface, but a good surface and broad feed lines, when rubbed strongly through a round, straight hole, but no feed lines before such rubbing.

All cylindrical grinding, by whatever method, will show lines of cut and feed when rubbed in a round hole or when lapped in any other way. There is a difference between a cylinder with uniformly distributed contact, when tested in a perfectly round hole, and a really perfect cylinder. A really perfect cylinder is one whose surface molecules are every one the same radius, or all touch the inner surface of a perfectly round ring when it is passed over the entire length of the cylinder. Such perfection can be obtained, approximately, by some form of lapping. Anyone who shall look for such perfection from grinding will be forever disappointed. Grinding, however, does give us vastly more points of contact than turning, or even careful filing to a micrometer and polishing with emery cloth—the method used by those who do not grind.

Broad Cuts Produce Most Accurate Surfaces.

Feed lines are caused by the "lap" of the wheel cutting twice on that portion of the surface—i.e., we do not traverse quite the exact width of the wheel at each revolution, but as near as safe, and avoid ridges. The wheel cutting twice over this narrow place leaves a different grain, therefore a different color, even though the measurable diameter there be no different from that elsewhere. In my apprentice days we used to plane all work with a very fine feed, and considered the best work that which showed no feed lines. But William Sellers showed us that the surfaces we produced that way were not perfectly flat surfaces, while he produced a more uniformly distributed contact, tested with perfect surface plate, by using a wide tool and a broad feed line. The surface he produced was not so smooth, but it was nearer a perfectly flat surface. No one disputes his theory to-day; all plane with a coarse feed.

Rough Turning Desirable for Economy in Grinding.

Another fact in connection with cylintrical grinding is this: With well-constructed grinding machines, the coarser the turning the quicker the grinding can be done. It is no longer necessary to turn either smoothly or correctly to size. A variation of 1-32 in. more or less on large work is of no moment, and on small work a variation of 1-64 in. more or less is permissible, and the surface may be very rough in all cases.

There are not enough good operators to run machines now installed, and the success of these machines is held back owing to the large amount of ignorance of grinding machines and grinding operations on the part of foremen, superintendents, and managers. The art is yet new, and invites the aid of young engineers in placing it in a still more useful position in the world's service. Cylindrical grinding is, however, firmly entrenched in America, and in many lines of manufacture all-round work is ground. All first-class automobiles have every round part ground; all sewing machines, typewriters, phonographs. Large machinery is also ground to a considerable extent.

HIGH-SPEED STEEL IMPROVEMENTS.

The announcement that S. Osborn & Co. are making a new and improved water hardening steel, points to the activity existing among steel makers in improving their products. One or two other leading firms have also new steels on the market, and the progressive movement in tool steel may certainly be regarded as general, and not confined to one or two makers. The new steels will not have the effect of ousting ordinary "high speed" from use, but are intended merely for special cases where the material dealt with is extremely hard, and in circumstances which make it desirable to run a tool for a long period without removing for grinding. Less stress is now being laid on the cutting speeds of these steels than on their durability. Machinery has generally been remodelled in the direction of weight and power, but when speeded up to the highest limit it still fails to exhaust the cutting capacity of ordinary high speed steel. Hence an engineer is not greatly attracted by the news of steel which will merely cut faster than heretofore. The end of improvements in fine steels has not even yet been seen, but whatever progress is made there is no reason to suppose that the present high-speed steel will become a mere back number, to quote a famous but somewhat unfortunate phrase.

W. H. Reynolds, who for the past five years has been connected with the Canadian General Electric as sales agent has resigned to take up a like position with the Eugene F. Phillips Electrical Works, Montreal.

Evolution of Philadelphia Compressed Air Grease Cup

The Peterborough Lubricator Manufacturing Company, Hunter Street, Peterborough, Have Installed Up-to-date Machinery for the Manufacture of Grease Cups — Method of Manufacture—Feeding the Grease.

The Philadelphia Grease Cup, the invention of John F. Lewis, Philadelphia, feeds solidified oil to bearings by compressed air. The evolution of the cups from sheet steel until they are polished ready for use, is very interesting. They are manufactured by the Peterborough Mfg. Co., who in February, 1909, bought a factory in Peterborough and immediately began installing modern machinery for their manufacture. This shop is now running in full swing turning out about 10,000 per month. By the addition of two more threading machines this output will be trebled.

Fig. 1 gives an idea of the layout of the shop which faces the south. The photograph shows the north end of the shop. The machines are arranged along the west side facing the light. In the background is shown the large press on which the heavy work in compressing the cups is accomplished.

Fig. 1.—General View of Shop.

The presses are shown in Fig. 2. These consist of a sixty ton press manufactured by the Ferracute Machine Co., Bridgeton, N.J. The small fifteen press was made by E. W. Bliss, Brooklyn, N.Y.

The threading machine is illustrated in Fig. 3. The machine is manufactured by the Loew Mfg. Co., Cleveland, and is known as their "Victor" type. It will thread sizes from ½ to 93 and has a capacity of over 10,000 cups per month. The dies are adjustable, the heads being known as "collapseable," screw cutting die heads, manufactured by the Geometric Tool Co., New Haven, Conn. A different size of head is used for each size of cup.

Other machines are a 20 in. drill from Bawden Machine Tool Co., Orillia St., Toronto; turret lathe from Foster, Kimball Machine Co., Elkhardt, Ind.; 14 in. lathe from Fay & Scott, Dexter, Me.; 10 in. x 15 in. shaper from McGregor, Gourlay, Galt; No. 1 wet grinder from Diamond Machine Co., Providence, R.I.; forge from London Foundry Co., London; 30 in. shears from Niagara Machine and Tool Co., Buffalo; and powerhack saw from D. McKenzie, Guelph. There are also polishing machines, etc. The blower for the forge is belt driven from the drill and can be used whether the drill is being used or not.

Fig. 4 shows the evolution of the funnel cup and top. In the manufacture of a funnel there are eight operations as follows: (1) pressing out of sheet, (2, 3, 4, 5) drawing the funnel, (6) swaying, (7) trimming and (8) punching holes and knocking out bottom. Each operation takes a very small fraction of time

Fig. 2.—The Two Presses.

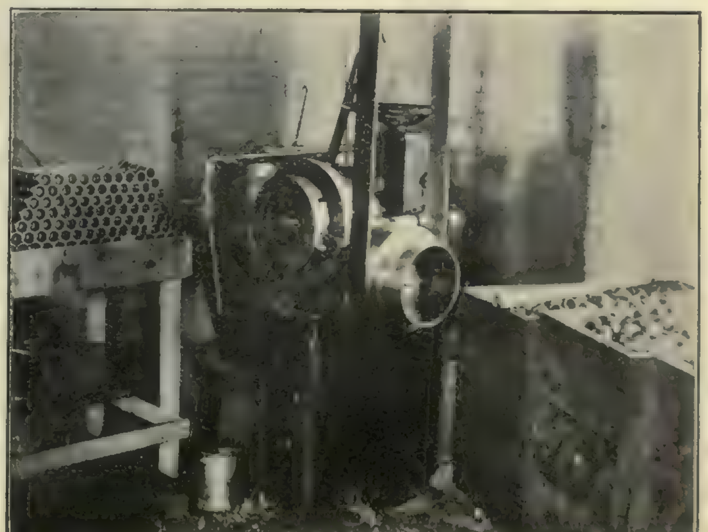


Fig. 3.—Loew Victor Threading Machine.

so that a great many cups may be turned out in a day.

There are six operations on the top, (1) blanking and half forming, (2, 3, 4) drawing, (5) putting on hexagon and (6) threading.

There are eleven operations on the cup, (1) blanking and half forming, (2, 3) drawing, (4) trimming, (5, 6, 7, 8) shank drawing, (9) putting on hexagon, (10) threading shank and (11) threading inside.

The hexagon is put on the cup by hydraulic pressure. The cup is put in a die in two parts with a hexagon shape in it, the cup is filled with water and the plunger is brought down. The pressure, presses the steel into the hexagon shaped die thus forming a hexagon on the cup.

Fig. 4.—Evolution of Funnel, Cups and Tops.

The loose disc is made in one operation, the cup disc is also made in one operation. The staples are made in one operation in adjustable dies, adjustable to suit the different sizes of cups. The tube is made in two operations, (1) cut out and fold and (2) bend ends over. Fig. 5 shows the parts of the cup and Fig. 6 is a sectional view showing the assembled parts. The hexagon nut is made in two operations, (1) punching, (2) tapping. There is no loss of material as the centre of the large one is used for the hexagon nut of the size smaller, etc.

A number of instalations have been made in Canada, including elevators, engines, machine tools, line shafting, etc. The bearings and machine tools of the Peterborough Lubricator Mfg. Co., are equipped with them and a large number of elevators in Toronto. The East City Furniture Factory, Peterborough, use them on a sander, planer and carver. The carver runs 10,000 r.p.m. and runs ten hours a day, the 1 oz. cup requiring only adjustment each morning. The others do not require attention as often.

The cups are made in five sizes, ½, 1, 3, 6 and 9 oz. The feed is controlled by compressed air. The cup is filled when convenient. By giving a partial turn of the grease cup top the grease will feed without further attention.

The President of the Canadian company is Wm. Harstone, merchant, Peterborough; Vice-President, A. Cornwell,

Fig. 5.—Parts of Cup

retired merchant, Toronto; Sec.-Treas., R. A. Elliott, merchant, Peterborough, and managing director, Cyrial Currier, formerly manager of the Ontario Coal Co., Peterborough. The other three di-

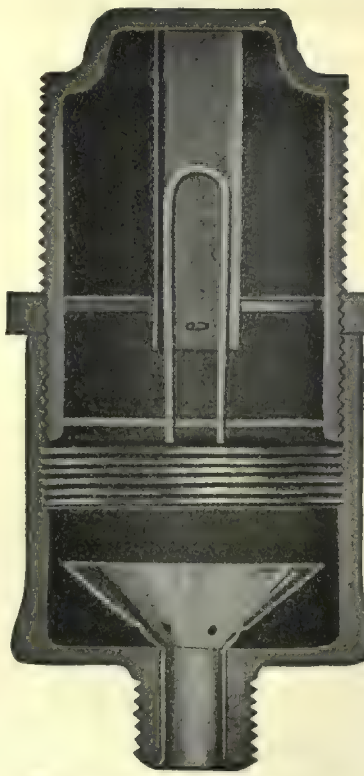


Fig. 6.—Interior View of Grease Cup.

rectors are: W. H. Denham, manager Quaker Oats Co., Peterborough; J. H. Larmouth, manager Peterborough St. Ry. and Power Co., Peterborough, and A. A. Bowman, sales manager for the Canadian Rand Drill Co., Toronto. The superintendent is W. C. Pennington, formerly of the Doty Engine Works, Goderich. Fred T. Daville is the salesman, Toronto.

The company was organized by M. W. Boerema who holds the controlling right for all foreign countries outside of the United States, to manufacture the Philadelphia grease cup. Mr. Boerema is visiting England to establish a factory there to supply England and all foreign countries.

THREAD FOR TAPS AND DIES.

By. Wm. H. Tims.*

Should the "V" standard thread be dropped and the U.S. standard be substituted?

Having had fifteen years' experience in the manufacture of threading tools of various standards, I feel qualified to express an opinion on the above question. In the first place the so-called "V" thread, as produced by the various manufacturers is only approximate as regards being standard for the reason that it is an impossibility to produce a theoretically correct "V." Should we supply a tap with a theoretical V thread, that is angle diameter only, the outside diameter of this tap would be reduced .002 to .005 by hardening, and this without taking into account the reduction in O.D. from threading down to the theoretical angle diameter. Consequently the difficulty experienced in procuring from the different makers a standard V thread. For to overcome the above mentioned reduction in diameter the various manufacturers of V threading tools have added an amount to the angle diameter in order to produce a flat top on the thread. Of course this is hardly perceptible, but nevertheless it is there. This addition strengthens the cutting points of the thread and the tool retains its cutting size longer. And it is in this very addition that the difficulty lies, because no two small tool makers produce the same sizes strictly speaking, in angle, or make the same allowance of flat. Hence the impossibility of procuring a standard V. What is standard with one firm is not standard with another, and any manufacturer can tell you of loose nuts and tight bolts, or vice versa. And this is especially true if he taps his own nuts and buys his bolts in the open market.

In addition to this the strength of the V thread as compared with U. S. standard or Whitworth is almost one quarter less. One of the strongest arguments in favor of the adoption of the

* Superintendent Pratt & Whitney, Dundas.

U.S. standard is that the A.S.M.E. have adopted same for their new machine screw sizes. In the face of these facts why should manufacturers be loathe to part with the V standard thread. Some will tell you that the initial expense of changing is too great, but if they will keep account of the expense incurred in cutting down bolts or rethreading nuts for one year, I have no doubt but that the change would be quickly made. And they must also bear in mind that all nuts with the exception of a few sizes in V thread can be tapped out U.S. standard and that all bolts can be practically used. Of course the fit will not be as it should but it will be as near as they have been getting with the V thread.

Besides this, a set of U.S. standard threading tools for nut and bolt work will outlast four sets of V tools, because of the lasting qualities of the flat top and bottom. It is a well known fact that after cutting a few bolt or nuts with a V tool that the thread commences to round over and that by the time they are worn out the last nuts tapped will not fit the first bolts and that the last bolts cut will not fit the first nuts for the reason that both bolts and nuts have a round bottom and this condition reverses when a fit is sought.

Re the Whitworth thread which is admittedly the strongest of the three standards. This thread is almost as difficult to produce on an interchangeable basis, as the V thread because of the difficulty experienced in producing the correct form of thread. To get and keep the correct form of this thread necessitates a very expensive series of operations, which only the larger manufacturers can afford. It costs from three to five times as much to maintain the Whitworth as the U. S. standard and the advantage gained is a little extra strength in cross section over the U.S. form. Does this pay?

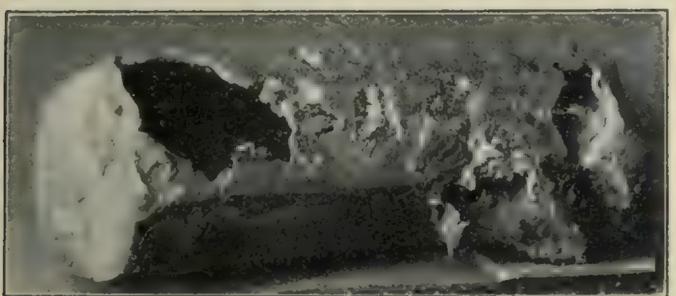
The Brown and Sharp Mfg. Co. makes gauges for grinding the correct U.S. Flat on forged tools. The gauges list at $2.00 each and in my opinion every tool room should be equipped with one or two of these. They enable any workman to produce a U. S. standard thread in a few minutes. There is no workman living who can grind a true Whitworth form which if necessity must be produced by tool makers of long experience in the production of forming toools.

MELTING OF STEEL FROM THE INTERIOR.

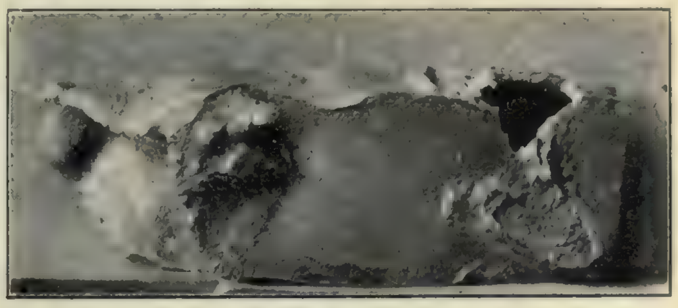
By G. P. Blackiston.

The real true meaning of that saying of Lemierre "It is a profound error to presume that everything has been discovered; it is to take the horizon which bounds the eye for the limit of the world" was never more forcibly illustrated than by the recent discovery by the writer that steel, contrary to the general belief, invariably melts from the interior.

Such a statement no doubt, appears somewhat absurd or unreasonable to the novice or even those better informed upon the subject of steel in general, but who have never had the pleasure of closely examining this strange phenomenon. In view of the doubt which may exist in the minds of some, the writer reproduces herewith two photographs, one showing a flat, while the other an octagan bar—both hammered bars of crucible steel—extracted from the furnace at the proper moment.



Octagon Bar of Tool Steel Showing Outer Shell in Perfect condition and Interior Missing.



Bar of Hammered Crucible Steel Showing Outer Shell and Hole in Interior.

Close examination of these reveal the fact that both are hollow on the interior while the outside surface still retains in general, the original shape of the bars.

The fact was first discovered by the writer some years ago while experimenting with a new type of the Kirkwood Oil Furnace. The charge, composed of steel and iron scrap, having been placed in the melting furnace and subjected to an intense heat, was examined at regular intervals to ascertain the effect upon the charge.

A desire to examine a portion of the charge at closer range, before it had become fully molten, a portion of same was removed from the furnace and permitted to become cool. As the pieces composing the mass, had become closely adhered to one another, it was necessary to break the several pieces of scrap apart. It was here that the bars of iron and steel were found to consist of mere outer shells—the interiors having evidently become molten and escaped through holes (weak spots) in the surface to the bottom of the furnace.

Examination of the different bars revealed the fact that the thickness of the shells varied in ratio to the composition of the product—the high carbon bars being thinner than those of the lower or softer character.

Fearing that this phenomenon might be occasioned by the oil fuel as used in the Kirkwood furnace, the writer, immediately started extensive experiments in other style furnaces and with all grades of scrap and fuels. The final results were the same as regards the melting of the interior before the exterior. In these tests, crucible, open hearth and special furnaces were tried with the same satisfaction.

It was therefore, not a mechanical but a chemical result. With this in view, a complete series of experiments or tests were made with the final solution that it was due to nothing other than the oxidazation of the surface which naturally melted first, the melted metal forcing its way through a weak section of the outer wall. When the heat reached the necessary degree for the complete liquidation of the entire bar, the outer surface also lost its shape. The high carbon steels naturally melted first while the low carbons followed and the wrought iron being the last to succumb to the flames.

At just what degree the several carbons began to melt upon the inside has not yet been definitely determined by the writer, due to the lack of proper facilities for the satisfactory solution of these points.

Whether such a chemical action is true with the Bessemer process, the writer doubts very much, not having however, fully tested the same to his entire satisfaction. It is possible that the force of the blast and the rapidity of action which is peculiarly characteristic of this operation, would somewhat obviate this strange formation.

Some Little Things in a Machine Shop that Count

Many Economies may be Obtained in the Machine Shop by Looking after the Little Things—Carelessness is a Source of Much Loss.

By K. CAMPBELL

I have had occasion to visit a number of machine shops recently and I found that a number of of machine shop foremen and superintendents were paying a great deal of attention to details and were eliminating a great source of loss. In some of them, however, there were a great number of improvements that could be made with a very small outlay, that would give 100 per cent. returns on the investment.

Where a Motor Would Pay.

In one shop a long line of shafting was continued to a small outbuilding. Here a small forge was used probab y once a week to forge tools. The shop was run by motors, "group drive" being the system adopted. Instead of having a small motor for this forge, however, the long line of shafting was continued out through to the forge, using up power in friction.

A Friction Clutch Solved the Problem.

In another small shop, belt drive was adopted but a number of machines were not needed during part of each day. The shafting and loose belts were consuming a large amount of power until a friend suggested a friction clutch.

In another shop, the lighting generator was connected up by belt each evening. This was found to be disastrous to the belt which needed constant repairs. By insta'ling a friction clutch this trouble was eliminated.

Oily Waste.

In some shops oil waste and other rubbish is allowed to accumulate in odd corners. If a spark in any way touches it, the labor of years is lost in an hour. The use of waste tins is not only encouraged by insurance companies but made necessary.

Waste receptacles are simple and inexpensive devices to install in various parts of the shop. A machinist can throw the oily waste in these. Each evening it must be collected and taken outside the building. It will prevent any chances of fire from oily waste.

Friction Losses.

Many a bearing is daily losing money for its owner in needless friction. This may be due to the failure of someone to keep it properly lubricated, proper oil or grease may not be used or the shafting may not be properly aligned. That is not as it should be and the small daily waste in friction amounts to large aggregate in a year. This would make a large profit if properly looked after.

The Tool Room.

One shop in Toronto was taken over by a new company who immediately made an inventory of the tools and machinery. No care had been taken to keep track of tools and hundreds of dollars had been spent in duplicate too's, many of them very expensive.

Now a new state of affairs exists. A central tool room has been established, tools of all kinds, wrenches, drills, reamers, and special tools all find a place. When a mechanic wants a tool he knows where to find it. "A place for everything, and everything in its place," is now a maxim and it means a large amount in the annual factory cost. The time saved by mechanics, alone, represents a big saving.

A Comparison.

It looks reasonable that if a workman wants a wrench, for instance, and knows where to find it, he saves time. As an examp'e Jones wants a wrench. There is no central tool room, he walks along the bench asking other workmen if they know where to find the wrench. Nobody knows and he loses probably half an hour before locating it.

In another case in a shop with a central tool-room, Brown goes to the tool-room for a wrench. No. 16 is using it. A list hanging in the tool-room shows No. 16 to be McGee. Brown goes to McGee, secures the wrench by substituting his check for McGee's, and is back at his bench in less than five minutes.

The above are a few of many little economies that may be effected in the machine shop. Any attention given the little things will well reward efforts put forth in that direction. The saving will not show directly but at the end of the year a big saving will be seen in the general expense.

PERSONAL NOTES.

C. M. Strange, Lewis Bros., Montreal, has been made vice-president of the Montreal Engineers' Club.

Arnold M. Bennett, of the Montreal Steel Works, was among those elected to membership in the Iron and Steel Institute at the recent annual meeting in London.

J. G. Glassco has accepted the position of electrical engineer of the Winnipeg power plant, and will begin his duties on July 15.

William W. Cox, vice-president of the Whitman & Barnes Mfg. Co., St. Catharines, manager of the local branch, died suddenly on June 3.

P. B. Yates, assistant engineer or the Hydro-Electric Power Commission, will address public meetings on hydro-electric power during the summer months.

Arnold M. Bennett, of the Montreal Steel Works, has been elected a member of the Iron and Steel Institute, at a recent meeting held in London, Eng.

Charles D. Warren, Toronto, has been elected president of the re-organized Lake Superior Corporation, and T. J. Drummond, of Drummond, McCall & Co., Montreal, has been elected second vice-president of the same corporation.

Jas. E. Hutcheson, general manager of the Ottawa Electric Street Railway, has been elected a member of the executive of the Canadian Street Railway Association, which has just concluded its annual convention at Winnipeg.

George Caverhill, of Caverhill, Learmont & Co., Montreal, has been elected a director of the Montreal Light, Heat and Power Co. Mr. Caverhill is a director of the Montreal Street Railway, Richelieu & Ontario, Dominion Steel Co., Royal Victoria Life, Montreal Loan and Mortgage, and several other concerns.

The Smith's Falls Electric Power Co. is re-organizing its staff. John Davidson, who has given such splendid service for years as superintendent, has to give all his time to his planing mill and has resigned. Succeeding him there will be two superintendents, A. S. Fraser, at present in charge of the power p'ant of the Frost & Wood works, and Wm. Henderson, who is now superintendent of the town's system of waterworks.

Often rust on iron that cannot be removed in any other way is so'uble in a saturated solution of chloride of tin. Care should be taken to have no free acid in the solution, and upon removal the iron should be rinsed in water; then in ammonia and quickly dried. The length of time which is necessary to keep the iron in the chloride solution depends upon the thickness of the rust, and will generally be from 12 to 24 hours. After this treatment the iron will have the appearance of dull silver, but a simple polishing operation gives it its natural color. Rust is removed from steel by brushing it thoroughly with a paste composed of one-half ounce of cyanide of potassium, one-half ounce of castile soap, one ounce whiting and enough water to make a paste. After the application of this paste, wash the stee' in a solution of one-half ounce cyanide of potassium in two ounces of water.

The Practical Side of Work at a Canadian University

Besides Book Learning, Students have Instruction and Practice in Construction and Erection of Power Machinery, etc.—A Description of the Thermodynamic and Electrical Laboratories.

By F. C. D. WILKES, B.Sc.

In view of the increasing attention that is being given to technical education as an adjunct to practical work in manufacturing plants it will be interesting to note briefly what is being done regarding practical work as an adjunct to our large technical institutions.

It is not all grind and book learning at our Canadian universities; the men that are turned out from the engineering courses have other knowledge of their friends, the engines, dynamos and accessories, beyond that which they take from books and lectures. Much money has been spent in fitting up workshops and laboratories with practical, up-to-date machinery, tools and equipment for making practical and commercially useful tests. As a good example of the progress this work is attaining a description of the workshops and laboratories at McGill University, Montreal, should prove interesting.

The Macdonald Engineering Building.

The engineering building is a fine example of modern construction, being made as absolutely fire-proof as is possible. Throughout there is not an ounce of inflammable material where it has been at all possible to eliminate it. The floors and stairways are all of reinforced concrete and steel; the lockers are all steel; the automatic fire-doors are of metal, and the whole interior is subdivided by heavy fire-proof walls.

The mechanical and electrical laboratories are on the ground floor of this building, and average 23 feet in height. The Workman building adjoins the engineering building, and therein are the pattern, carpenter, machine and smith shops and the foundry.

Thermodynamic Laboratories.

In the steam laboratory, Fig. 1, tests of engines, air compressors, etc., are made, and the student gets a good training in the working of prime movers. The largest unit is the one seen at the back of Fig. 1. This is a 120 h.p. vertical engine, especially designed for investigating the behavior of steam under various conditions. The cylinders are 6½, 9, 13 and 18 inches in diameter, by 15-inch stroke. These are so connected as to allow of working as a simple, compound, triple or quadruple expansion engine, either condensing or non-condensing, and with any rate of expansion desired. The jackets are so fitted as to permit of measuring independently the water condensed in the cover, barrel or bottom jacket of each cylinder. The engine can be worked with any desired initial pressure up to 200 pounds per square inch. The measurements of heat are made by means of large tanks which receive the cooling water and the condensed steam. There is an independent

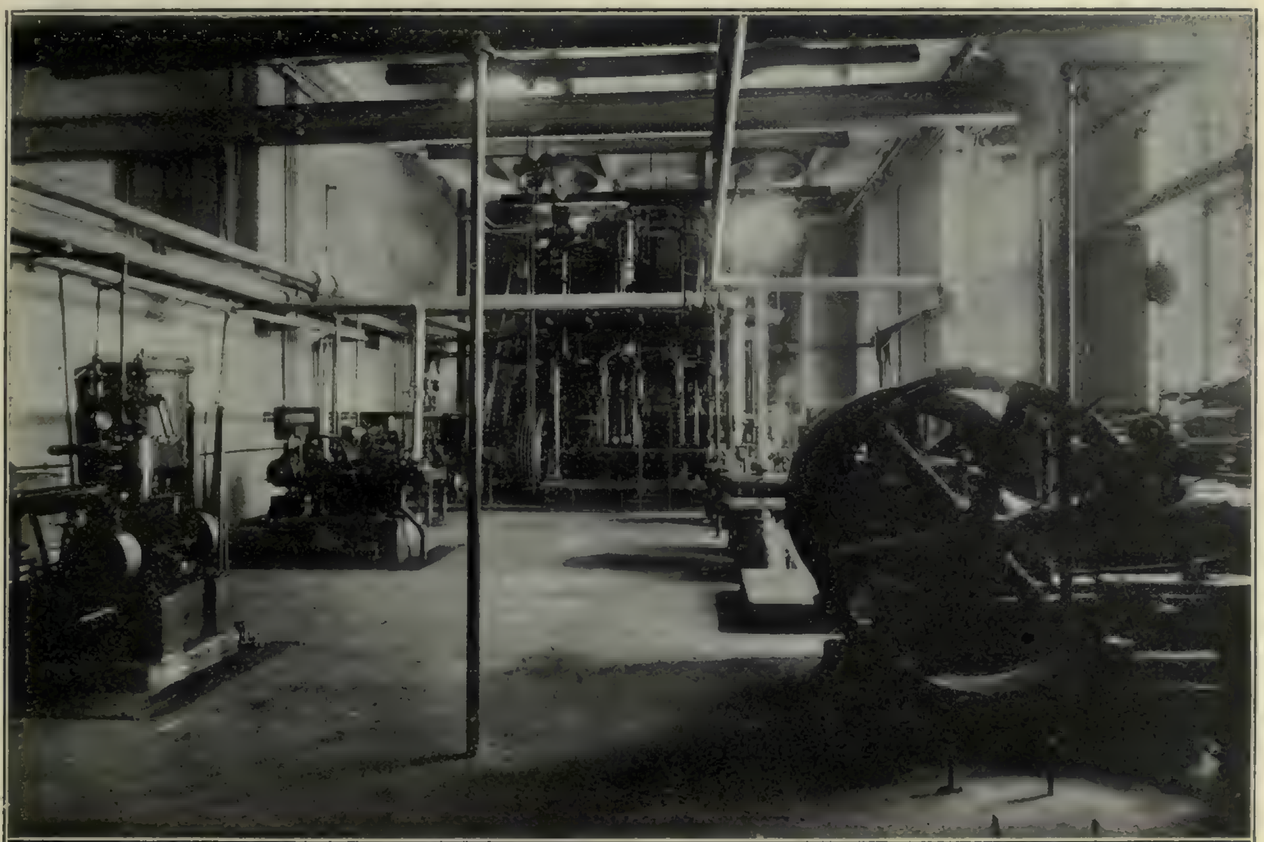


Fig. 1.—Thermodynamic Laboratory, Macdonald Engineering Building.

surface condenser and air pump and the arrangement of tanks and scales is very convenient, permitting very accurate work to be done. The power of the engine is absorbed and measured by means of two Froude hydraulic absorption brakes and an alternative friction brake.

The other machinery in the laboratory includes the following: A Robb automatic cut-off engine, having a cylinder $10\frac{1}{2}$x12 inches. This engine is especially fitted up for the measurement of cylinder temperatures and can be run at speeds up to 200 r.p.m., the power being absorbed by a friction brake. Connected to this engine is a Wheeler condenser having a surface of 200 square feet. This is also fitted up for special work.

A McIntosh-Seymour high-speed automatic engine, 12x$12\frac{1}{2}$ inches, is connected to an air compressor through a chain drive. This engine is fitted with an automatic recording apparatus for registering the load on the brake. The compressor, which was designed and built in the University workshops by third and fourth year students, is a two-stage machine, taking 40 h.p. and having cylinders 10 and 17x15 inches. The compressor discharges into reservoirs placed under the floor of the machine shop and is provided with an intercooler, whose copacity can be varied as desired.

There is an 8x9-inch Leonard horizontal engine especially fitted for instructional work in valve setting, provided with an independent surface condenser; a standard $9\frac{1}{2}$-inch Westinghouse air brake pump, fitted for testing and for supplying compressed air for experimental and other purposes; a Blake non-rotative steam pump with cylinders $4\frac{1}{2}$ and $2\frac{3}{4}$x$4\frac{1}{2}$ inches,; a vertical compound engine, 3 and $5\frac{1}{2}$ x $3\frac{3}{4}$ inches (seen in the left foreground of Fig. 1), which was also designed and built in the workshops by the students.

Fig. 2.—The Alternating Current Laboratory, Macdonald Engineering Building.

Gas Engine Laboratory.

This is provided with apparatus that is especially arranged for exhaustive tests in the working of gas engines and accessories. The equipment includes: A horizontal gas engine of 40 h.p., supplied by the National Gas Engine Co., having a cylinder 12x20 inches; a suction-type producer for the above, with all the necessary scrubbers and cleaning apparatus; a down-draft producer, designed for working with lignite and bituminous coal; a standard 4-inch gas meter, gasometer and exhauster; an Atkinson gas engine of 6 h.p. working on city gas; an Otto type gas engine, cylinder $8\frac{1}{2}$x12 inches, built in the University workshops for city gas; a two-cylinder 4 cycle gasolene automobile engine of 8 h.p., also built in the University workshops.

The smaller apparatus belonging to the laboratories includes the necessary equipment of weighing machines, brakes, calorimeters, thermometers, gauges, pyrometers, fuel testers. indicators, planimeters and a Moscrop recorder.

Boiler Instalation.

This is the one that supplies steam for heating and power purposes and is so arranged as to be available ıor experimental work and tests in connection with the work in the thermodynamic laboratories. The students run off about four complete 12-hour tests and get good instruction in boiler work. The equipment includes one Cornish boiler for heating service, rated at 50 h.p.; one loco-boiler of the Belpaire type, rated 100 h.p.; one Robb-Mumford internally fired tubular boiler, rated 120 h.p.; two

Babcock-Wilcox water tube boilers, each rated 60 h.p.; one Yarrow water tube marine boiler, fitted in a closed stokehole, for working under forced draft, rated at 150 h.p. These boilers are all provided with the necessary tanks, weighing machines and apparatus for carrying out evaporative tests.

Alternating Current Laboratory.

In this laboratory (Fig. 2), which is situated on the ground floor of the engineering building, all dynamos are motor-driven. Speed regulation is attained either by varying the voltage supply to the motor or by varying the motor field current. Power is obtained from three independent sources of supply, two 75 k.w. d.c. direct connected units in the main service plant and one 300 k.w. hour storage battery. All generators and motors are mounted on strong testing benches of different heights, with plotted floors, so that any machine when placed on a bench, may be quickly secured in any desired position. These benches are supported on longitudinal slotted rails and may be removed to any position in the laboratory and there bolted to the rail. An overhead 3-motor electric traveling crane permits of rapid and easy transference of machines. All wiring is done below the floor level in passages provided for the purpose and special switchboards are provided for current distribution. The starting resistances are placed in concrete compartments. Special testing tables fitted with switches, circuit breakers, etc., facilitate the work.

Sixteen alternating current machines, including single, two. and three-phase generators, synchronous motors, synchronous converters, together with stationary and rotary induction apparatus, are provided for alternating current work. Large variation of wave form may be obtained by use of specially shaped inductors and field poles. Induction motors with wire wound rotors serve as induction generators and frequency changers. The laboratory is likewise provided with about 100 volt meters, ammeters and watt meters of standard make and of different ranges; also speed indicators, condensors, rheostats, standard resistances, etc.

This laboratory (Fig. 3), situated on the second floor of the Workman building, is similar in design to the alternating current laboratory, all generators being motor-driven and mounted on convenient benches and similarly supplied with power. Two hand-operated traveling cranes serve these machines. The laboratory is equipped with 28 or 30 commutating machines; constant potential generators of various types; shunt, series and compound wound motors; variable speed interpolar motors, boosters, dynamotors, closed and open coil constant current machines of many different makes varying in capacity to 40 kilowatts. Some 75 voltmeters and ammeters are also provided, as well as the usual accompaniments of starting boxes, controllers, rheostats for absorbing power, etc.

Shopwork.

The course in shopwork is intended to afford some preparation for that study of workshop practice on a commercial scale which every engineer has to carry out for himself. It is a physical impossibility for the university to turn out a technical man and have him at the same time a journeyman machinist, carpenter or the like. What it does do however, is to give the student such instruction in the ground work of different shop practices that he obtains some knowledge of the nature and properties of the various materials he employs; he receives systematic instruction in the use and care of hand and machine tools —so that he will, at least, know the difference between a right and left-hand monkey-wrench—and he also acquires some manual skill.

Fig. 3.—Direct Current Laboratory, Macdonald Engineering Building.

Fig. 4.—The New Macdonald Engineering Building at McGill University.

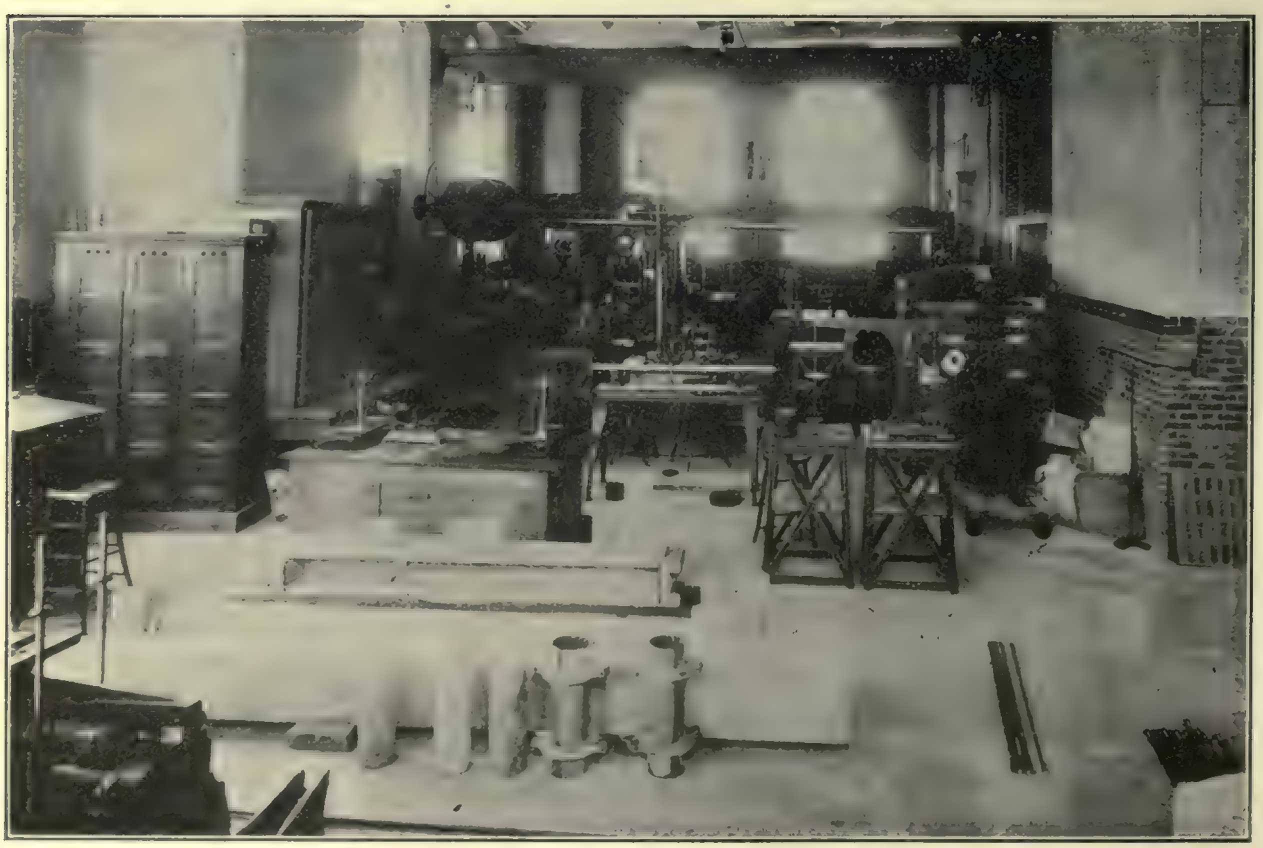


Fig. 5.—Testing Laboratory in the New Engineering Building.

The instruction thus obtained must, however, be continued and supplemented. For this reason each student is expected to spend the greater portion of each summer vacation in the employ of engineering workshops outside of the university.

Throughout the course advanced students are, as far as possible, entrusted with the construction and erection of machinery and apparatus which are to form part of the equipment of the department. As an example of this work, besides the compressor and engines mentioned above, there is a duplex feed pump, a boring bar, a belt testing machine and other apparatus. The students are expected to assist in the repairs to the boilers, engines, machine tools, etc., required in the department.

The book part of the shop work consists in the keeping of note books. These are filled with portions of certain text books, relating to shop work, extracts from technical pournals, etc. Each student is also required to keep a record of his work, which are made in standard forms. These are handed in to the shop instructor and form part of the basis upon which credit for shop work is given.

The course in shop work consists of practical work in each of the five following courses: Carpentry and joiner work, pattern making, smith work, foundry work and machine shop work.

The Machine Shop.

The main machine shop at McGill is situated on the ground floor of the Workman building and is well lighted, heated and ventilated. The equipment consists of twelve 18-inch engine lathes, one 18-inch turret lathe, fitted for stud and screw making, one 27-inch engine lathe, one 72-inch surfacing lathe, one brass-finishing lathe, one 36-inch vertical drilling machine with compound table, one universal milling machine with vertical milling attachment and dividing headstock, one planer capable of taking work up to 24x24 ins. x 5 ft., one 9-inch slotting machine, one 16-inch shaper, one universal grinding machine, centering machine, a cutter grinder, a tool grinder and a buffing and emery grinding machine. There are vise benches for eighteen students, with the necessary hand-tools, and a marking-off table. The tool room contains a full equipment of drills, reamers, milling cutters, and accessories, gauges, calipers, and other measuring instruments.

It will be seen that the equipment is adequate for the performance of a wide range of work. This work consists of exercises in chipping, preparation of flat surfaces, filing to straight edge and surface plate, scraping, screwing and tapping, use of scribing block and surface gauge, marking off work for lathes and other machines, turning and boring cylindrical work to gauge, surfacing, screw-cutting and preparation of screw-cutting tools, use of turret lathe, taper turning, machining flat and curved surfaces on the planing and shaping machines, plain and circular milling with vertical and horizontal spindles, gear-cutting, cutter-grinding, drilling and boring, use of jigs, grinding flat and cylindrical surfaces, cutting tools for hand and machine, their cutting angles and speeds, dressing and grinding tools.

Carpenter and Pattern Shop.

The carpenter shop and the pattern shop contain thirty-eight carpenters' and pattern-makers' benches, complete with the necessary sets of hand tools, twenty-two wood-turning lathes with their turning tools, a large pattern-makers' lathe for face-plate work, one circular saw bench, a jig saw, a band saw, two wood trimmers, a surface planer, a thickness planer, a mortising machine, a saw-sharpener, and one universal woodworking machine.

With these tools the student is given a good course in carpetnry and joiner work with the following exercises:—Sharpening and care of wood-working tools, sawing, planing and paring to size, preparation of flat surfaces, parallel strips, and rectangular blocks, construction of the principal joints employed in carpentry and joiner work, such as end and middle lap joints, end and middle mortise and tenon joints, mitres, and

Fig. 6.—The Smith Shop, Workman Building.

dado and sash joints, dovetailing, scarfing, joints used in roof and girder work, wood-turning, use of wood-turning tools.

The exercises in the pattern shop consist in learning the use of pattern-makers' tools, elements of pattern-making, allowances to be made for draught and for contraction in molding and casting, use of contraction rule, preparation of prints and plain core-boxes, exercises in paring and turning, construction of patterns and core boxes for pipes, flanges, elbows, tees, and valves, more difficult exercises in pattern-making, including built-up patterns and face-plate work, gear and wheel patterns.

The Foundry.

The foundry, (Fig. 7), like the rest of the shops, is up-to-date in every particular, and contains benches, tools and apparatus for bench and floor molding and core-making, and is able to accommodate twenty students. A gas-fired brass melting furnace, a cupola for melting iron, and the necessary core-ovens and core-benches give facilities for undertaking iron foundry work in green and dry sand, and for brass molding, The shop is served by a hand traveling crane of one ton capacity.

Stud^nts are taught the how and why of molders' tools and materials used in foundry work, the cupola, the brass furnace, preparation of molding sand, boxes and flasks, core-making, use of core-irons, bench molding, b'ackening, coring and finishing molds, vents, gates and risers, special methods required in brass molding, floor molding, open sand work, advanced examples of molders' work, melting and pouring metal, mixtures for iron and brass casting.

All the power for these shops is taken from the central station of the university, each shop having its own system of motors.

The above description will serve to show that the student gets a good deal more than book learning at a university. and finishes with a good ground knowledge, at any rate, of the different types of machines and their uses.

For the photographs we are indebted to the courtesy of the Montreal Standard.

There is no prospect that the hammer, chisel, and file will ever be banished from our fitting and erecting shops; but it is likely that they will find a very useful auxiliary in the portable grinding machine arranged so that a man can hold the frame carrying the emery or other suitable wheel in his hands, and direct it over the surface to be trimmed, machined, or polished. There are already two or three types of these machines on the market, but they hardly make the progress that one would expect. In no small degree this is due to conservatism, but it is also due probably to a failure on the part of makers to adapt their machines for the rapid trimming of castings. A great deal of this sort of work is done by hand with hammer and chisel which could be much more quickly done by means of a light, easily adjustable, and portab'e grinder. The importance of these last two qualities is very great, for, of course, the time required to do a piece of work properly includes the time taken in finding and setting up any tools or appliances which may be necessary.

Fig. 7.—The Foundry, Workman Building.

The Smith Shop.

The smith shop, (Fig. 6) is provided with sixteen Sturtevant forges, which are power-driven and are connected with an exhaust fan. There is a power hammer, and the necessary equipment of anvils, swage blocks, sets, flatteners and other tools. Provision is made for instruction in soldering and brazing.

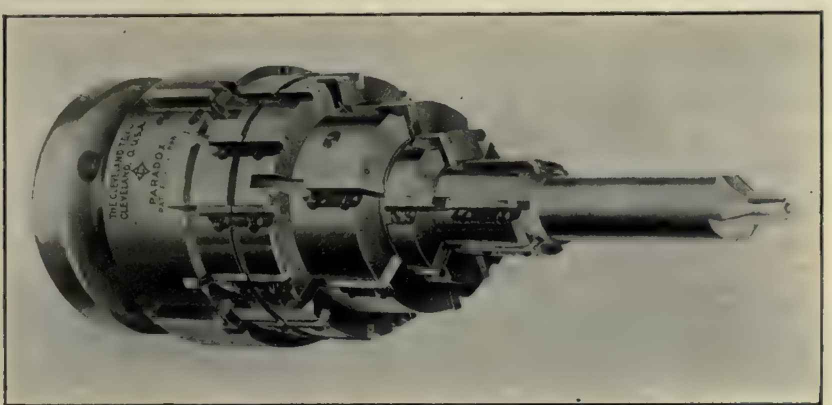
The work consists in learning the use and care of smiths' tools, management of fire, use of anvil and swage-block, drawing taper, square and parallel work, bending, up-setting, twisting, punching, and cutting, welding and scarfing, forging, hardening and tempering tools for forge and machine work, tempering dri'ls, dies, taps and springs.

MACHINE SHOP METHODS AND DEVICES

Unique Ways of Doing Things in the Machine Shop. Readers' Opinions Concerning Shop Practice. Data for Machinists. Contributions paid for.

SPECIAL FINISHING TOOL.

The accompanying illustration shows a special tool made recently by the Cleveland Twist Drill Co. for a cream separator company in Cleveland. The tool was designed to rough-finish, ream and face all the holes in the casting, there being no less than eight cutting diameters necessary. It is 6½ in. in diameter and 21 in. long, weighing close to 100 lbs., and consists of a countersink, five reamers of different diameters, each made of inserted adjustable high speed steel blades, and finally a formed facing tool for facing and rounding the top rim. In all, there are 34 inserted blades, 12 of them being of a combination double cutting type, making with the four countersink lips a total of 50 cutting edges.



Special Finishing Tool.

The body is made up of a cylindrical casting, holding the upper two sets of blades, into which is fitted a second and smaller body of machinery steel, turned and slotted to hold the next three sets of blades, and this body in turn holds the countersink which is made of hardened tool steel. The tool is bolted on the boring head of a large horizontal boring machine.

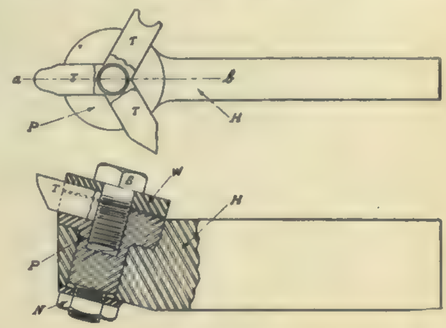
The multiplicity of operations accomplished by this tool makes it a great labor and time saver, the high speed steel blades reduce the regrinding necessary to a minimum; but in the long run, the chief economy of the tool will be found in the adjustable blade feature. A built up tool of like character with solid reamers would scarcely pay in service for the large initial cost involved, for when one of the reamers was worn below size, the usefulness of the tool, as a whole would be destroyed. The blades, on the other hand, can be adjusted to size again and again, and when finally worn out can be replaced at small cost with new blades while the reamer body remains as good as ever. Last, but not least, the cost of the reamer was considerably less than that of a set of individual high speed tools necessary to perform the various operations.

SOME HANDY DEVICES.

By J. H. R., Hamilton.

One of these shows a very handy tool holder to use up the small pieces of steel usually discarded by the ordinary tool holder. H is the tool holder bored out to receive the piece P, which is shaped out on the end to take three of the small pieces of tools T T T.

The tools are clamped in position by the washer W and the screw S. The tools can be moved to any desired position by the use of the nut N. This tool is only for use on light cutting such as corners, fillets and small forming tools, as the arrangement will not stand very heavy service.

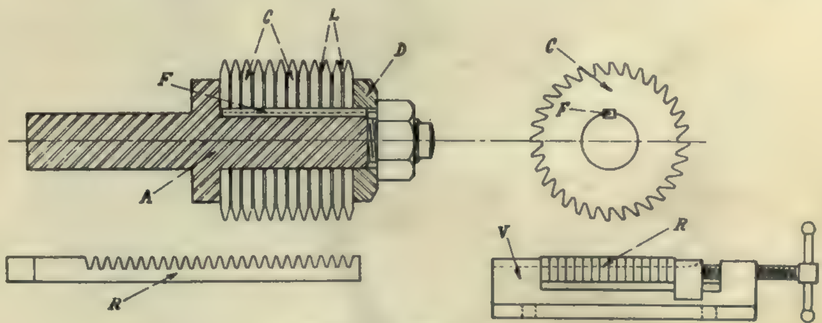


Tool Holder.

The other sketch shows a sectional milling cutter used for cutting small racks used in lamp burners. One end of the arbor, A, is fitted to the spindle of the milling machine, and the other is turned to receive the cutters C and liners L.

The cutters C are made from sheet steel while the liners L, are made from sheet tin, the gauge necessary to get the desired pitch of the rack R.

The cutters are securely clamped together with nut and washer and the feather F. A number of the racks are fastened in a small vise V and milled together.



Sectional Milling Cutter.

FINISHING DUPLICATE PARTS.

A simple and compact time-saving device for finishing duplicate parts requiring slabbing, milling or slotting across the piece, has recently been designed for use on the "Acme" automatic multiple spindle screw machine.

The attachment as shown in illustrations one and two, is fastened to the top of the tool slide, carrying the cutting-off tool, and operates on the piece in the third position, while the thread is being cut. Two milling cutters set at a given distance apart on a vertical arbor driven by beveled gears, form a shaft

carrying a pulley, which receives its power through a belt from a "Simpul"

Fig. 1.—Attachment.

countershaft. The feed of the cutters is controlled by the cutting-off cam, its throw being increased by an auxiliary lever, which is shown in Fig. 1.

The operation takes place during the time required for the forming and box milling operations in the first position, and while the stock is being held stationary in the third position for the threading operation. (For this reason, this attachment is adaptable only to "Acme" machines). As may readily

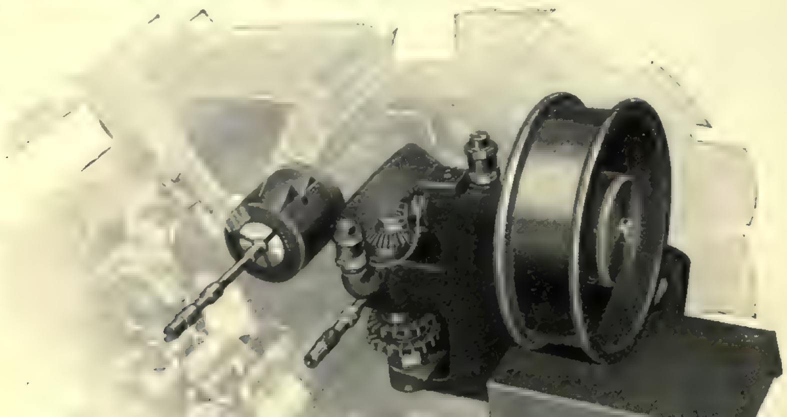


Fig. 2.—Attachment.

be seen, a block rests on the cutting-off slide, the slide above the block being adjustable for location of the cut. The fixture above the slide is dove-tailed into slide and fed forward by lever, shown at the back of pulley, Fig. 2.

In attaching this device to a regular machine, it is only necessary to drill and tap two holes in the top of the cutting-off slide.

This attachment was put on a No. 53 "Acme" automatic (a 1-in. machine) for the purpose of slabbing the piece shown in illustration No. 3, for the Cadillac Motor Car Co., Detroit. This piece is being made in the Cadillac factory from cold rolled steel at a rate of 53 pieces per hour, this being as many as could be obtained without the slabbing. The previous method of making these pieces produced less than one-third as many per hour without the slabbing, which was handled as a second operation. The entire cost of rehandling for this operation is saved by the use of this attachment.

This is one of a number recently designed for the machine for eliminating rehandling of duplicate parts by drilling, milling, slotting, slabbing and counter-singing parts on the machine, which previously required second operations.

It is possible to drive these attachments without the special countershaft by directly connecting them to the die spindle gears in the main tool slide, a telescoping shaft, knuckle joints and beveled gears being used. This makes it possible to drive the machine with the single belt or motor without any special over-head arrangement for the attachment.

Fig. 3.—Piece Machined.

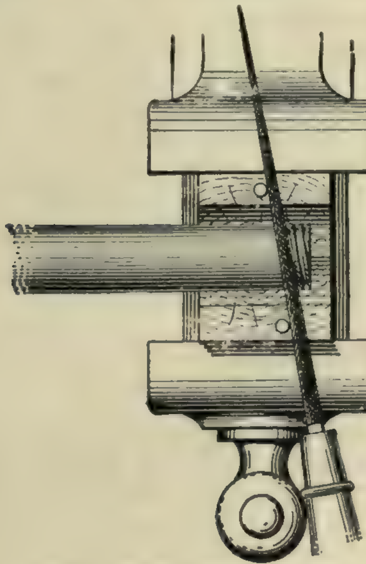
THREAD CUTTING WITHOUT A DIE.

By J. A. Bergstrom.

It sometimes happens that the threads of a bolt or a pipe break off and must be cut without the aid of a screw-cutting die. This can be accomplished very easily with the aid of an ordinary half-round file and a little patience.

Take a block of wood and fasten it in a vise. Make a V groove in the block deep enough for the center of the pipe to come a little below the surface. If the pipe is long, it will be better to make two of these blocks, so as to keep it steady. Now into this groove place a pipe with thread same as wanted, and on one side of the block drive in a nail. Place the flat side of a half-round file against this nail and see that it forms the same angle with the pipe as the thread does. Then drive in another nail on the opposite side of the block, so that it will touch the flat side of the

file. Now remove the pipe and replace with the one to be threaded. Hold the file with the smooth side against the nails and while filing keep turning the



Thread Cutting Without a Die.

pipe. The pipe should be rocked backward and forward. That is to say, on the forward stroke of the file turn the pipe in the opposite direction, thereby insuring a much better thread.—Scientific American.

PLANING CAST-IRON PLATES.

By Arthur Jacques.

We recently had to plane 36 cast-iron plates 3 ft. 6 in. by 3 ft. by ¾ in. thick. These plates (A in Fig. 1) were cast fairly straight, and had two lugs at each end which were cramped to the planing-machine table as shown in Fig. 1, the lugs being cut off after the plates had been planed. These plates were wanted fairly straight and smooth.

We planed the first plate in the orthodox way—that is, we first packed the plate under the lugs till it was straight enough to clean up, and then packed the edges all round about every 6 in. with metal shims. We took a roughing-cut over, using two tools at ⅛ in traverse. When these were over we tried the plate with a straightedge, and found the centre to be 1-16 round. Of course, this meant planing the plate over again. Then we finished it with a broad goose-neck tool. When tried again with a straight-edge it was 1-32 in. round. This was more than we were allowed, so we decided to risk this plate, and then looked round for some method of holding the plates down solidly at the centre. Eventually we designed the following apparatus and found it worked splendidly, stopping all chatter and leaving a straight surface.

We first got a bar of iron 2 in. wide, and the same thickness as the slots in the planing-machine table, the slots of our machine being ¾ in. wide. We cut off three pieces 4 in. long, and planed them taper as shown at B in Fig. 2. We then got another bar of iron of the same thickness but only 1 in. wide, and cut off three pieces 2 ft. 3 in. long. We then planed the ends to the same taper as the blocks B as shown at C. This is all the apparatus needed.

The method of using it was as follows:—Three wedges were first driven in the slots in the centre of the planer table. Our table having five slots, we used the centre slot and the two outside ones. The wedges are shown at D in Fig. 3. When these are driven in, sufficient room must be left underneath in case the bars C project under the block B. When the wedges were driven in the pieces B were put beside them, as shown in Fig. 3. The plate was then put on the table, taking care that the blocks B came somewhere near the centre. After the plate was levelled in the usaul way the bars C were slid in and pushed so that the taper part raised the blocks B till they came in contact with the plate A, the blocks B being kept from sliding forward by the wedges D. If the plate was now rapped it sounded solid all over. When the bars C had been pushed in, the cramps were fastened on the lugs of the plate in the usaul way, taking care that the holding-down bolts were pushed up against the bars C. If the ends of any of the bars C came underneath the lugs a piece of packing was put in to make up.

We found this method gave a good, straight, clean job, stopping all groaning and chatter, and the average time to finish a plate completely was lowered from five to three hours, which included setting, roughing, and levelling. Our planer has a cutting speed of 40 ft. per minute, and returns at 80 ft., using A.W. steel. It will be noted that the corners of the blocks B and bars C are rounded so that the bars will go under the blocks easily.

When finishing with the goose-neck tool the man got tired of holding the clapper box up when the table was reversing, so we made a lifter as shown in Figs. 4, 5, and 6. This consists of a shank A made from 1 in. square iron to which we fastened a link B having a roller C at the end. The lifter was fixed in the clapper D with the tool, the roller C being slightly lower than the edge of the tool. When the tool was cutting, the roller just ran on the plate idly as in Fig. 4, but when the planer table wes reversed the link B lifted up the clapper by the pin E, and so the tool cleared the plate as shown in Fig. 5. Fig. 6 is a front view showing the lifter fitted in the clapper, the tool being at the other end.

When the goose-neck tool was ground and fastened in the clapper we lapped the edge in the following way. We had a brass lapping plate charged with fine emery powder which we put behind the tool on the planer table. We lowered the tool till it was slightly below the lapping plate; then by sliding the plate under the tool we could lap the edge of the tool, so that when used it left a fine polished surface, the separate tool marks scarcely showing. The tool cutting edge being below the lapping plate, was lifted away slightly, which gave the necessary clearance. The brass plate was charged by putting fine emery on the top, then rolling in with a piece of 2 in. shafting.—Mechanical World.

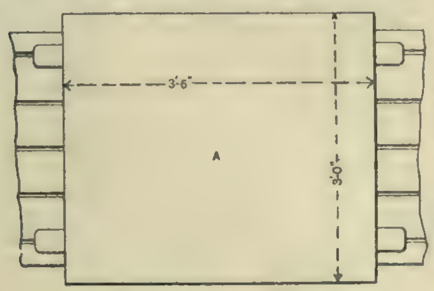
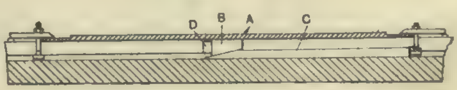


Fig. 2.



Planing Cast-iron Plates. Fig. 3.

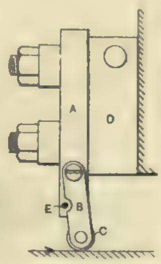


Fig. 4.

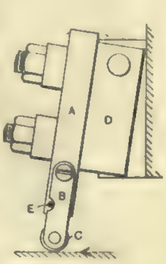


Fig. 5.

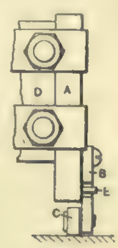


Fig. 6.

One of the points of advantage in tempering high speed steel tools with the assistance of barium chloride is that when the hot tool is withdrawn from the bath a thin coating of barium chloride entirely covers it, and it may be quenched in oil or cooled in a draft of air without oxidation. Oil-quenching is recommended. It is also well to preheat all tools larger than ⅜ of an inch in section before placing them in the barium bath.

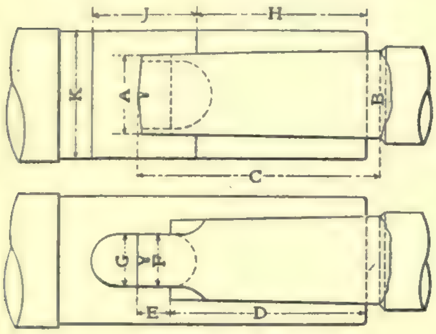
DEVELOPMENTS IN MACHINERY

New Machinery for Machine Shop, Foundry, Pattern Shop, Planing Mill; New Engines, Boilers, Electrical Machinery, Transmission Devices.

A NEW STANDARD.

Taper shank twist drills with broken or badly distorted tangs have always been a source of trouble and expense. The cost of turning a new shank on them is considerable, and if this was not possible, they have been consigned to the scrap heap.

The Standard Tool Company, of Cleveland, Ohio, is putting on the market drills, sockets and sleeves, having short taper shank. This overcomes the trouble by means of a tang of much greater strength.



Stantool Shanks and Tapers.

Number of Taper	Diameter, Small End of Shank	Diameter, Large End of Shank	Total Length of Shank	Depth of Hole in Socket	Length of Tongue to End of Socket Hole	Thickness of Tongue	Width of Keyway	End of Socket to Keyway	Length of Keyway	Diameter of Socket	Taper per Foot	Taper per Inch
	A	B	C	D	E	F	G	H	J	K		
1	0 378	0 484	2¼	1⅜	¼	⅛	0 268	1⅜	¾	11/16	0.600	.05000
2	0 587	0 706	3⅛	1 13/16	5/16	3/16	0.388	1¾	1	1 1/16	0.602	.05016
3	0 800	0 911	3 13/16	2¼	⅜	¼	0 520	2	1¼	1 5/16	0.602	.05016
4	1 030	1 244	3½	3	7/16	⅜	0 645	2 11/16	1½	1 11/16	0.623	.05191
5	1 515	1 757	4⅝	3¼	½	1	1.020	3¼	2	2 3/16	0.630	.05250
6	2 169	2 501	6⅛	5	¾	1¼	1.270	4½	2¼	2⅞	0.626	.05216
7	2 815	3 288	9	7¼	1	1½	1.520	7	3	...	0.625	.05208

Sizes of Standard Shanks and Tapers.

Sockets and sleeves are furnished, made with the outside taper to fit the old taper of spindles of drill presses; the inner taper being suitable for the new shanks and also made with both outside and inside taper, conforming to the new standard, and these latter interchange or nest into each other.

The tables give the exact dimensions of all sizes of these new taper shanks, known by the trade name, "Stantool."

The Standard Tool Co. are also manufacturing a gauge that, placed over the regular taper shank, shows size and location of the tang for the "Stantool" shank. This enables drills on hand to be converted into the new type at little cost and trouble, also enables old drills from which the original tang has been broken, to be utilized.

BROWN & SHARPE GRINDER.

Brown & Sharpe Mfg. Co., Providence, R.I., have placed on the market a new size of their No. 12 plain grinding machine, which swings 8 ins. and takes 36 ins. between centres. It is equipped with automatic feeds, and contains the typical features of the company's cylindrical grinders, together with a number of important improvements. It is designed for grinding spindles, shafts, rolls and all other work, either straight or taper, revolving on two dead centres, and is essentially a commercial machine. The work speeds and table feeds are completely separated, an arrangement deemed very important in the class of work it performs, because it is possible to obtain a correct table feed for any work speed and when it is desired to remove stock rapidly a slow speed and fast feed are available.

Among the new mechanical features of the machine is a lever replacing a shipper arm, putting in convenient position the control of the table traverse and of the revolution of the work. Another lever at the front of the bed changes the speed of the table feed from fast to slow or vice versa. A very important new adjunct is the mechanism which, by the pushing in of a knob, places the hand wheel in connection with the table traverse, and at the same time makes operative a clutch device which stops the feed at the end of the table traverse, so that the table comes to a standstill when the wheel is off the work at the footstock or when it is up to a shoulder at the headstock end. The cross feed is arranged so that the automatic feed of the grinding wheel slide may be disengaged, permitting it to be moved quickly by a hand wheel. Provision has been made for the rapid substitution of one wheel for another, the wheel being mounted in a sleeve on the spindle and the spindle in special spherical bearings which are self-aligning. The back of the machine has been widened out, making the tool more rigid, and the tank and pump have been inclosed.

Fig. 1 is a front view of the machine and Fig. 2 a rear view. Fig. 3 illus-

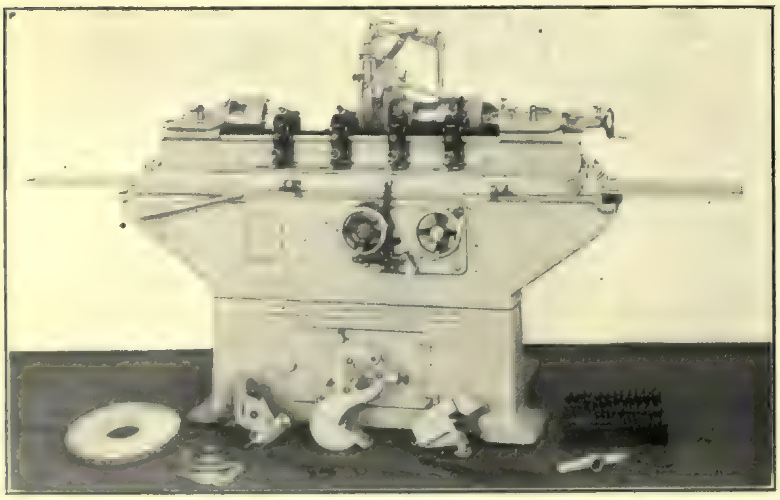


Fig. 1.—Front View.

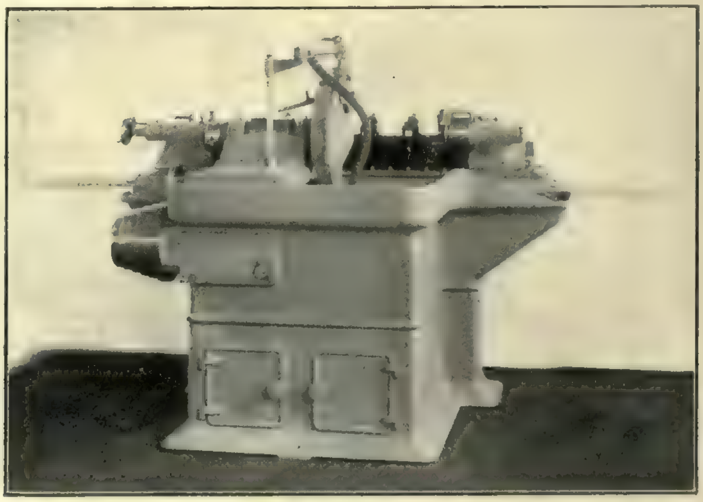


Fig. 2.—Rear View.

trates the overhead works and their new lever control. Fig. 4 is a detail of the reversing mechanism, and Fig. 5 is a section through the grinding wheel spindle, revealing the gearing for feeding the wheel toward the work.

The lever a, for starting and stopping that portion of the overhead works which feeds the table and drives the work driving pulley on the headstock,

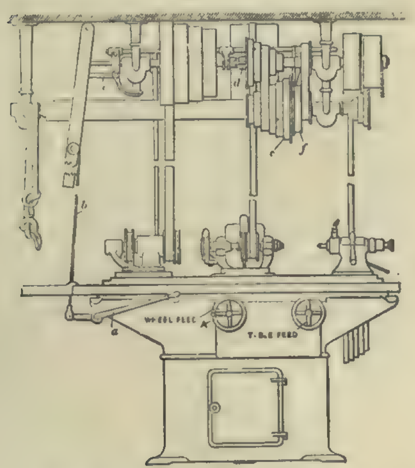


Fig. 3.—Countershaft and Control.

is shown at the left of the bed in Fig. 1 and also in Fig 3. It connects through a piece of wrought iron piping b with the bell crank lever c, which operates the clutch d. This clutch controls the pulley which is belted to the cone pulleys e and f, the former driving the drum and headstock, the latter the table feed, the reverse being procured by means of the clutches g and h, Fig. 4.

The automatic cross feed is of the type usually employed on Brown & Sharpe grinding machines, but with improved features. The hand wheel A, seen in Fig. 3, is connected to worm through shaft and gears, and meshes worm wheel C, Fig. 5. The worm wheel connects with the shaft D, Fig. 5, through the clutch teeth E. This shaft has teeth cut in its upper end, meshing with the rack F on the under side of the slide G, which supports the grinding wheel. The special new feature is that the lever under the hand wheel connects with the cam I, Fig. 5, through a shaft, the office of the cam being to raise the shaft D to which is pinned the clutch E. Raising the shaft by means of the lever operating the cam releases shaft D from the worm wheel and leaves the grinding wheel slide free to be moved quickly from one position to another through the agency of the hand wheel J, Fig. 5, a pinion fastened to it meshing the rack. The quick motion is of great value in depositing oil thoroughly on the sliding surfaces of the wheel carrying slide, and also serves to bring the wheel in position to grind when changing from one size work to another.

The system of gibbing the wheel carrying slide to its ways in shown at K. The gib is carefully fitted to its position and is not adjustable. If after years of service it is necessary to compensate for wear of the sliding surfaces, the gib can be removed and metal scraped from its upper surface, which would allow the bolts to draw it up higher in its seat, taking up any slack from wear without the danger of the operator clamping it so tight as to prevent the free movement of the wheel slide. The spindle carrying the grinding wheel is of one size throughout, and is exceptionally heavy for this size of machine. The oil chamber L leads around the bearing to the felt M, which provides an abundant lubrication for these very important bearings. The thrust of the spindle is taken by two convex washers, N, which insures correct alignment. The headstock is exceptionally heavy and rigid, and an extremely wide belt is used for driving it. The machine rests on three bearings on the floor.

The spindle is of tool steel, hardened, ground and lapped, and has phosphor bronze boxes, self-aligning and with means of compensation for wear. It takes wheels 16 in. diameter and 1½-in. face. The transverse movement is controlled by hand wheel, and a dial is graduated to thousandths of an inch on diameter of the work. The automatic cross feed ranges from 0.00025 to 0.004 in. at each reversal of table, is easily and quickly set, and is thrown out automatically when work is to size. The swivel table turns on a large central stud, hardened and ground, with bronze bushing, providing means of compensation for wear. It can be set at an angle

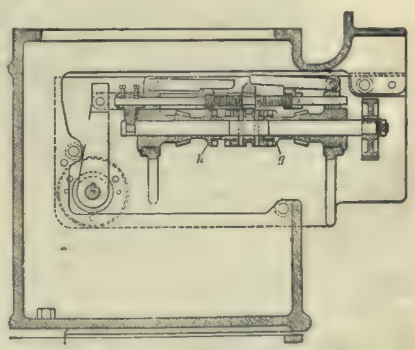


Fig. 4.—Detail of Reversing Mechanism.

to the table ways, the scale reading to 3½ degrees and 8 in. taper per foot.

The speeds of the wheel and work and of the feed of the table are entirely independent of one another. There are six changes of spindle speed ranging from 1,200 to 2,400 per minute, and 12 changes of work speed varying from 42 to 312 rev. per min., together with 12 changes of table feed, from 8 to 100 in. per minute, in two series available for any work speed. The change from one series to another is through a simple lever movement without changing of belts. The tight and loose pulleys of the countershaft are 14 in. diameter, with 4-in. belt, the speeds being from 395 to 405 rev. per min. The floor space of the machine is 51x144 in., and net weight 5,050 lbs.

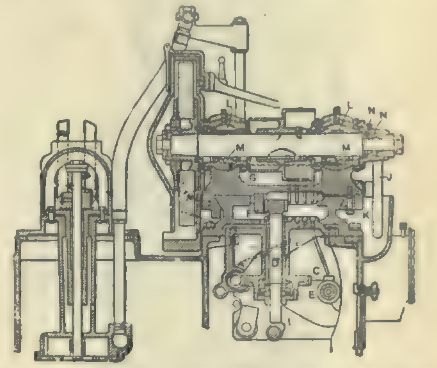


Fig. 5.—Section Through Grinding Wheel Spindle, Showing Gearing Feeding the Wheel to the Work.

ABRASIVE METAL-CUTTING MACHINE.

The Slack Mfg. Co., of Springfield, Vt., have perfected and will market a machine for rapid and accurate cutting of metal.

The advantages claimed for the abrasive metal-cutting machine are, that it is a rapid method of cutting metals. It will do all the cutting-off ordinarily done with hack saws, lathes, or milling machines and leave a perfectly square polished finish. It will cut air hardened steel, which has heretofore had to be notched and broken and in addition to cutting regular brass, copper or other tubing, it will also cut flexible tubing of any description, whether filled with rubber, webbing or woven wire, and make a smooth cut without burrs. It can also be used for notching and grooving work.

The base and head are very similar to many of the small tool grinders now on the market. The cutting is done by a specially prepared abrasive wheel composed of a patent combination of carborundum and other abrasive materials, 12 in. in diameter and 3-32-in. in thickness, running at a speed of 4,000 revolutions per minute. The arbor is made of crucible steel and all the bearings are dust proof.

The stock is brought into contact with the wheel by means of a patented swinging table, operated by a lever. This table is fitted with a cam, which holds the stock securely in place, and is also equipped with an adjustable stop, which gauges the length and depth of cut accurately.

This abrasive metal-cutting machine is designed to cut air-hardened, high-

speed, carbon or cold rolled steel, brass, bronze or any other metal whether round, square, flat, tubing or other form.

Tests of these machines have demonstrated that they will cut high-speed and

Cutting-off Machine With an Abrasive Wheel.

carbon steel, 5-16-in. square bars in five seconds, ½-in. square bars in ten seconds, without drawing the temper. Steel, nickel and brass tubing, ½-in. in diameter, can be cut off in two seconds, leaving a true finish with no burr, and other sizes as fast proportionately.

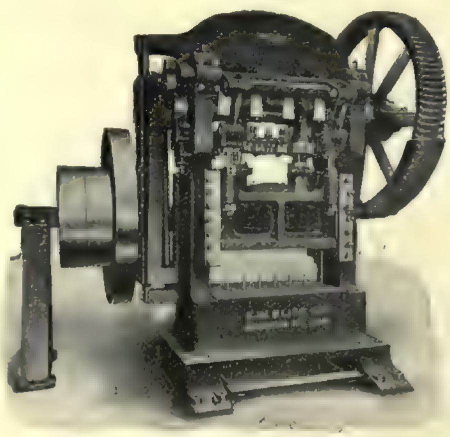
The machine weighs 250 pounds. The dimentions are 16 in. by 16 in. by 39 in., and it will cut stock up to 2 in. in diameter. The machine is designed for use in all branches of the metal trades and will be especially valuable for use in automobile plants, machinery, electrical and railroad shops.

DOUBLE CRANK TOGGLE DRAWING PRESS.

The E. W. Bliss Co., of 20 Adams Street, Brooklyn, N. Y., has designed a new type of press, known as the double-crank toggle drawing press, which is built in ten sizes. The original design of this type press was made some three years ago. The press shown, however, has been redesigned to embody such changes and improvements in detail of construction as recent experience has demonstrated to be of advantage. The frame of this press is of large proportions and is cast in one piece, giving a maximum amount of strength and rigidity. The punch slide has a stroke of 8 inches, and is actuated by a high carbon-hammered steel double crank shaft of large diameter. The pressure on this slide is distributed over two points, by screw connections, and work in unison when adjusting the slide, insuring perfect alignment at all times. This adjustment is accomplished by oscillating a ratchet lever.

The blank holder slide which has a stroke of 6 inches, encases the punch slide, and the pressure on it is distributed over four points by heavy steel screws. This slide is actuated by the Bliss patented toggle motion. The toggles made of steel, receive their motion from the crank shaft through an outside slide, which is operated by a crank connection on the end of crank shaft. The blank holder slide mechanism is balanced to avoid undue strain upon it, The construction insures all stress borne by the blank holder slide being taken by the press frame. At the beginning of the stroke the blank holder slide first moves down, while the punch slide first moves upward a trifle, and then downward with the blank holder slide, but somewhat behind it. When the blank slide dwells the punch slide continues its downward movement and forces the blank into the die, causing it to slip between the lower side of the form and even holding pressure. The punch slide then moves upward together with the blank holder slide, and the drawn and stamped shell is pushed out of and to the top of the die by a knockout actuated by the b'ank holder slide.

The press shown will handle a 42x23-in. blank of No. 14 gauge steel, or



Bliss Double Crank Toggle Drawing Press.

smaller blank of heavier stock in proportion. It will take a drawing punch 12x36½ ins. A patented jaw clutch, entirely of steel, is used on this press, and all gears are cut. The main gear is 73 ins. in diameter, with an 8-in. face. The fly-wheel is 62 ins, in diameter with 6-in. face and weighs 1,800 lbs. The press makes 30 strokes per minute, and the driving shaft 205 revolutions per minute. Total height of the press is 10 ft. 9 ins., and the floor space over all is 10 ft. 9 ins. by 7 ft. 3 ins. The weight complete is approximately 42,000 lbs. It is for use in drawing and stamping large forms of irregular shape, such as trays, stove tops, seamless roasters, etc., where the drawing and stamping is down in one operation.

NEW CAR AXLE.

J. E. T. Powers, Nanaimo, has two models of a car axle, which it is claimed will work a revolution in railway haulage. The new axle is the discovery of Mr. Seabrooke, a British Columbia engineer. It has not yet been adopted by any railway, but it is being tested on some of the American lines, and so far has not been found wanting. With present axles on railway trucks, the two wheels are rigid on them. The result is grinding friction at every curve, and besides increasing the probability of a wreck, the life of the axle is lessened, the flanges are worn out and the life of the rail reduced. With all this, the load on the locomotive is increased, with a general increase of wear and tear. In Seabrooke's differential axle, the wheels are independent of each other. The axle is cut in two in the centre, and fitted into a box or jacket. There is no friction in turning curves, the wear and tear is reduced, in short there is economy all round. The new axles have been tested on a car over 100 miles of stiff track on the Santa Fe railway. One manager claimed that the new axle would increase the breaking strain of a car. When he fitted the wheels on a car and took it out, it was the conviction that a wrecking train would shortly follow. Instead, every test was met. A chalk mark on the flanges was not even erased. A company is being floated to put the axle on the market.

W. J. Clokey, founder of the Farmers' Co-operative Harvesting Machinery Co., of Whitby, died at his residence, 64 Beatty Avenue, Toronto, on Saturday, June 19, in his fifty-third year, after a long illness.

Arthur H. Milroy, of the Milroy Co., 196 King St. West, Toronto, dealers in machine shop supplies, was married on Wednesday, June 9th, to Miss Lyna McCullough, of London. After the wedding, Mr. and Mrs. Milroy spent a few days in Detroit and other western points before returning to Toronto, where they will reside.

POWER GENERATION AND APPLICATION

For Manufacturers. Cost and Efficiency Articles Rather Than Technical.
Steam Power Plants ; Hydro Electric Development ; Producer Gas, Etc.

TRANSMISSION OF POWER BY ROPES.*

With the aid of guide pulleys, rope transmission may be carried forward to enormous distances. But how far centres may be placed from each other without intermediate support, is largely a matter of pulley dimensions and driving direction. Naturally with large pulleys the under and over traveling portions of the rope are kept well apart, and again there

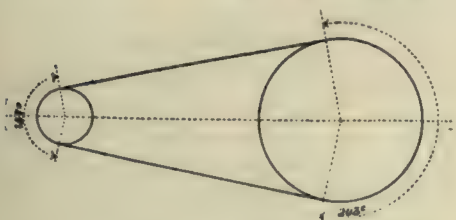


Fig. 1.—Long Centres.

is always an amount of sag on the working side of a long distance drive which helps to prevent contact even with the

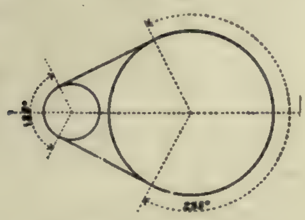


Fig. 2.—Short Centres.

slack above the pulleys. There are numerous unsupported drives with centres varying from 70 to overside 100 feet but these for the most part are working with the slack of the rope below the pulleys.

Short Centres.

A swing of the metaphorical pendulum brings us to the opposite extreme, and suggests contiguity. The transformation

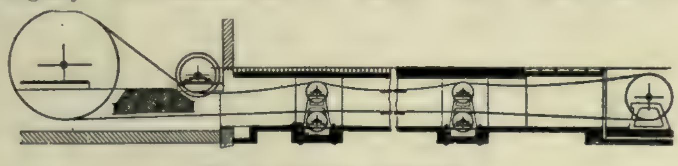


Fig. 3.—Awkward Conditions.

of a spur gear drive to ropes at a Belfast factory brought the pulleys into close proximity. In this case the pulleys are both 8 feet in diameter, with centres 9 feet apart, thus allowing a clearance of 12 inches between the rims.

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* Second of a series of articles describing the system of rope drive used by William Kenyon & Sons.

When the two pulleys are equal in size, it is not necessary to make allowances for loss of contact, but should

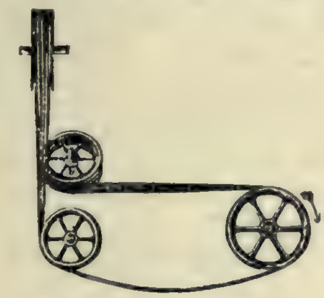

Fig. 4.—Right Angle Drive.

they vary, more rope must be employed to make up the deficiency.

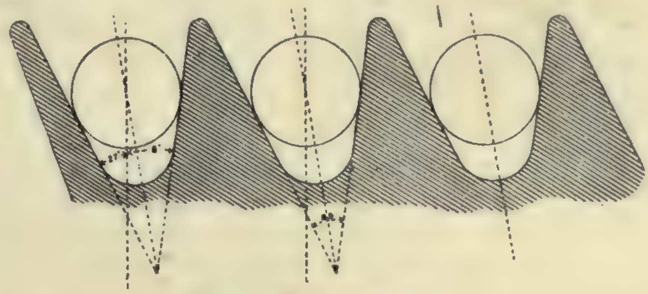

Fig. 6.—Tilted Grooves.

Awkward Conditions.

Rope drive lends itself readily to awkward conditions. It is so flexible that with the aid of guide pulleys, any angle may be negotiated or corner turned.

Fig. 5.—Shafts Slightly Out of Parallel.

Perhaps there is not a case where the difficulties arising out of awkward conditions have been more successfully tackled than at a large timber works in Dundee. Here 225 h.p. is transmitted from a pair of engines, through an underground tunnel to a distant shaft by means of rope. From Fig. 3 it will be seen that guide pulleys are employed to deflect or sustain the ropes in their passage along the tunnel. These are placed at unequal distances, the centres for the whole range reading as follows: 16 ft., 15 ft. 6 in., 29 ft., and 22 ft. respectively.

Centres at Unequal Distances.

The unequal distribution of centres along the driving track has the advantage of breaking up the measure of any oscillation which may be set up in the ropes. Strong wane-like vibrations are sometimes observable between the engines and the first guide pulley where the load is suddenlly removed or when starting which, as they cannot synchronize along the entire length, quickly diminish the mere rippling disturbances.

Right Angle Driving.

Shafts fixed at right angles may be successfully driven by the aid of guide pulleys as shown in Fig. 4. It will be seen that the pulling side of the rope is deflected by the guider resting at the necessary angle, while the "idle" side is directed by the pulley having the horizontal axis.

Right angle driving may also be accomplished by the introduction of guide pulleys running freely (in opposite directions, of course) upon a vertical shaft. Deep grooves require to be cut into the guiders, and it is necessary for the ropes to be kept moderately tight.

Guide Pulleys Generally Too Small.

In the majority of cases guide pulleys are made sadly too small, and on this account the ropes are worn out much sooner than they would be, if a similar rule to that which governs the relative diameter of ropes and pulleys in ordinary driving were adopted. True, the arc of contact is less, but this is no relief to the strain put upon a rope in passing sharp curves.

The quicker rate at which small pulleys have to revolve, coupled with indifferent lubrication, frequently proves a hindrance to crane driving, hence the reason why sustaining pulleys are often discarded and substituted with grooved

slippers of hardwood such as lignum vitae, over which the ropes slide with far less damage.

Shafts Slightly Out of Parallel.

When shafts are only slightly out of parallel, ropes will direct themselves

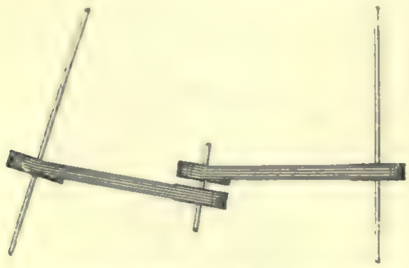

Fig. 7.—Shafts Out of Parallel.

without the help of guiders. The limit of deflection at which this may be accomplished, governed as it is by centre distances, cannot be definitely fixed to meet all cases, and it is better to rely upon experiments in each particular drive than upon any data suggested by past experience.

What is generally recommended is to arrange the drive so that the ropes will run parallel with the driven pulley from the centre of the driver, the latter being the smallest in Fig. 5. From this position the pulley may readily be moved

Fig. 8.—Cross Driving.

a trifle one way or the other if long key-ways are cut in both shafts.

Tilted Grooves.

In some cases a tilted groove, like that shown in Fig. 6, is brought into requisition, which, it will be seen, gives more slope to one side than the other, with the intention of saving space and of allowing the ropes to roll with greater ease into their driving positions. A reference to Fig. 5, which gives a somewhat exagerated definition, reveals the fact that immediately the rope attains its working position in the groove the pressure exerted is at right angles with the face of the pulley, and is therefore

Fig. 9.—Cross Driving.

equal to both sides, whereas, in the tilted groove the pressure is greater on one side than the other.

The best groove for this purpose is undoubtedly an obtuse, well-polished one; the polishing should be extended to the terminals over which the rope must pass before it enters.

When the angle of deflection is too great for one set of pulleys and space will permit intermediate shafts are introduced (sometimes two or three) and the angle divided between them.

The drive shown in Fig. 7 is one where the shafts are 15 degrees out of parallel. Dividing this by an intermediate shaft, and running the ropes in grooves of 50 degrees has most effectually overcome degrees has most effectually overcome the difficulty. It should be well understood that in all such arrangements, it is necessary to allow extra rope upon the usual estimate, and indeed this rule should be enforced whenever awkward conditions are imposed.

Cross Driving.

Cross driving, shown in Fig. 8, is readily effected by ropes, and although

Fig. 10.—Half-crossed Driving.

there must of necessity be a greater amount of friction upon them than when driving under ordinary conditions, the wear and tear at the crossing point is not as terrific in actual practice as might naturally be expected, because the strain upon the driving portion permits the slack to pass by without exerting much pressure; and if the crossing is alternated as in Fig. 9, which shows a drive of four crossed ropes with two central grooves empty to give greater freedom, the tight and slack sides run in couplets, thus further reducing the friction.

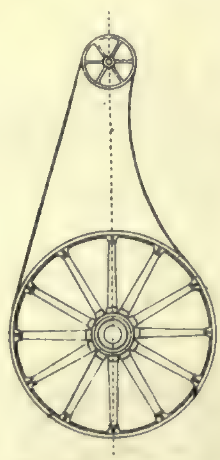

Fig. 11.—Vertical Driving.

Half-Crossed Driving.

Fig. 10 illustrates the application of ropes to right angled, or half-crossed drives, which may be either vertical or horizontal as circumstances dictate. In the last mentioned position ropes are often used to convey power from the vertical spindles of turbines to horizontal shafts.

The method of adjustment is practically the same as that adopted for belts, and allows the slack of the rope to fall direct into its appointed groove, while the tight side is pulled away at an angle. As the intensity of this angular wrench is decided by the distance of centres in relation to size of pulleys, it is never advisable to bring the shafts nearer together than five times the diameter of the largest pulley. The remarks re long key-ways and well-polished grooves also apply in this style of driving.

Vertical Driving.

Power may be successfully transmitted to shafts upon the same vertical line. grooves of not more than 30 degrees, backed up with good ropes are the best influences to counteract the retarding effect of gravitation. When the drive Fig. 11, was constructed, it was deemed necessary to transmit the power obliquely to and from an intermediate pulley, but afterwards this pulley was removed and good driving ropes attached direct from driving to driven pulley with beneficial results.

A large spinning mill has adopted vertical driving and is working satisfactorily with centres at about 42 ft. and pulleys 12 ft. and 4 ft. diameter respectively.

NEW PROCESS OF TEMPERING STEEL.

Martin S. Kolman controls a process which, he claims, will convert finished iron into steel. Speaking of what is claimed for the new process, Mr. Kolman says:

"We can work up a fine razor blade out of iron, shaping and grinding it to the required form, and after this is all done we put the blade through our steeling process and convert it into the hardest kind. Steel blades produced in this way are equal in every respect to the finest makes. The method of making is simple. Iron is treated with a chemical composition, being subjected to heat at the same time. The chemical fumes have a peculiar property, converting iron into steel and tempering it to wonderful hardness. It is extremely likely that the English rights for our process will be sold to Vickers, Son & Maxim, and other big firms of similar character are negotiating for the rights in other countries."

CANADIAN MACHINERY AND MANUFACTURING NEWS

A monthly newspaper devoted to machinery and manufacturing interests mechanical and electrical trades, the foundry, technical progress, construction and improvement, and to all users of power developed from steam, gas, electricity, compressed air and water in Canada.

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Vol. V. JULY, 1909 No. 7

CYLINDRICAL GRINDING.

The advantages of cylindrical grinding are being recognized by Canadians and there has been a demand for information in regard to this class of work. We have on several occasions published in Canadian Machinery, well illustrated articles on the subject, contributed by such authorities as F. N. Gardner, president of the Gardner Machine Co., Beloit, Wis. These received some very favorable comments. In this issue we are publishing a lecture prepared for the Mechanical Engineering Class, Columbia University, by C. H. Norton, another well-known authority on Cylindrical Grinding.

The cylindrical grinder is designed to assist the lathe, increasing its efficiency besides giving an excellent quality of output. As Mr. Norton puts it, "sometimes we grind without turning, usually we do not." As an adjunct to the lathe in engine manufacturing plants, automobile works, etc., the cylindrical grinder will be found almost indispensable. An accuracy can be attained by this machine that cannot be obtained by any other method. For slender work especially the cylindrical grinding has been found to give good satisfaction. The accuracy of the grinding machine is the commendable feature and in view of the interest taken in this subject the article, "Cylindrical Grinding," dealing with finishing methods, will no doubt be read with a great deal of interest.

CANADA'S TRADE REPORTS.

Trade figures for the month of May show most gratifying increases in both imports and exports, and indicate that the trade of the Dominion has practically recovered from the depression which set in during the fall of 1907, and is now almost equal in volume to the high record set two years ago.

Imports for the month totalled $28,060,076, an increase of $5,183,547 over May of last year. For the first two months of the fiscal year the imports totalled $50,592,549, an increase of $7,792,625 over the corresponding period of last year. The customs revenue for the month shows an increase of $670,000.

Exports of domestic produce for the month totalled $15,810,207, an increase of nearly two millions. For April and May the exports totalled $27,673,004, an increase of $2,471,704. The total trade last month, including coin and bullion, amounted to $44,911,726, an increase of $7,029,650. For the first two months of the fiscal year the increase in the total trade has been $11,457,926.

BRITISH PATENT ACT.

The new patent law is being interpreted in a broad, intelligent manner and not as a purely routine affair. This is indicated by the refusal of the Comptroller-General to revoke patents on the ground of inadequate manufacture in this country unless applicants can show conclusively that the law is not complied with.

An abstract from the Sheffield Daily Independent gives figures showing the extent to which England claims to have benefited by the new patents act.

"Since this act came into operation, in August, 1907, the country has benefited by foreign capital to the extent of $1,518,978, made up as follows: Value of rent and premises acquired by foreign manufacturers in England, $570,690; amount expended on erection of buildings, housing of work people, etc., $522,450; amount expended on plant, machinery and equipment of factories, $425,838. The value of the annual assessment on which local authorities will receive rates (i.e., taxes) will be $86,309 per annum."

Up to the present time nine patents in all have been revoked by the Comptroller-General, for good and sufficient reasons, the last one just announced being Patent No. 14,948 of 1900, concerning steam generators, which has been revoked on the application of the S. M. Car Syndicate.

These revocations are exceedingly important, says a firm of agents in London who has negotiated the sales of many of the sites, for they show that the conditions of the act are being enforced, when there is no intention of complying with the act. This firm is now in negotiation with foreign firms for the erection of works in this country (Great Britain), the trade including engineering, chemical works, electrical plants, rubber making, pottery works and steel foundries. The districts which have so far benefited most by the advent of new industries from abroad are Enfield, Flintshire, Hayes, Leicester, Liverpool, London, Manchester and Warrington. At all of the factories English workmen for the most part are employed. In one or two instances the firms have brought over their own overseers to instruct the work people, and in some cases they have taken English hands abroad so as to initiate them into their methods.

TOO MUCH AVERAGE MAN.

Did you ever look through a magnifying glass? Things look larger than they really are, don't they? Did you ever come to work in the morning and find work piled around your machine so you didn't know where to start? Or around your desk? You felt like sitting back and letting things take care of themselves, but if you start at one thing finished it and then started at the next and so on, what a difference it makes. The trouble is some people will not start. They are forever gazing at a molehill through a magnifying glass. The man who is above the average is the man who does things. They never acknowledge defeat. They never give up. The quitter is a failure. This is the law of life. The man who lets his work conquor him is a quitter.

There are men who have surprised their employers by a change of method, which is due to putting into practice things they have learned by keeping their eyes open. The Foreman, Superintendent, Master Mechanic, Mechanic, Cashier, Manager who gets in a rut will be numbered among the average men. You cannot change your course if you are in a rut; it allows no development or expansion. Progress requires changes occasionally. A "good enough" method isn't "good enough." What everyone wants is the best. You cannot develop a man with one food; neither can a man be a hundred point man by walkin a rut. If something works well, try again. You will find something that will work better. The whole development in the mechanical world has been because men who were above the average worked for something better.

The hundred point man may look like all other men or dress like them, or talk like them, but whatever position they hold they are true to their trust, they keep their word and are true to their company. Do your work and do it well. There are too many self-satisfied average men. Aim to be more than the average; be a one hundred point man.

EMPLOYMENT OF MINORS.

The Canadian Manufacturers' Association are drawing the attention of manufacturers to Section 3 of the Ontario Factories Act, reading: "No child (i.e. persons under the age of fourteen years) shall be employed in any factory except in the business of canning or desiccating fruits and vegetables and the work incidental thereto."

TRADE WITH GERMANY.

Reference was made in the May issue of Canadian Machinery to the agitation in Germany for more friendly feelings between Germany and Canada. A German-Canadian Association has accordingly been formed in Berlin with the object of securing the abolition of the Canadian surtax in return for the extension of the continental tariff to Canadian products

The German Government, it is understood, is considering the best means of rendering the Canadian and German markets more accessible to one another. To this the Canadian Government is apparently favorably disposed. The Berlin Association has decided to send to Canada a deputation of representative business men. Meanwhile the association is organizing public lectures and publishing pamphlets extolling the excellence of Canadian products and the immense resources of Canada, and pointing out the advantages of the country as a field for German emigration. This propaganda is being carried on in the hope that Canada will display gratitude towards the nation which shows a preference for the produce of the Dominion.

TOPICS OF THE MONTH.

Canadian customs revenue continues to respond to the stimulus of good times. During the month of May the collections totalled $4,296,660, which is $728,968 more than was collected in May, 1908. For the first two months of the fiscal year the collections totalled $8,258,338, an increase of $1,250,000 over the corresponding period last year.

* * *

Queen's University, Kingston will have a new chemistry building erected with the Legislative grant of $20,000 a year for five years. They will also erect a building for mining and metallurgy. This will make fourteen buildings and will be an imposing collection. William Nicol, professor in Mineralogy at the School of Mining generously donated $40,000 for the new mining building. His example is worthy of being followed by others.

* * *

Some appreciative letters have been received recently by the Editors of Canadian Machinery, of which the following, from the Hamilton Bridge Works is a sample: "We have received the June issue of Canadian Machinery in which is included an article on the manufacture of steel bridges at the Hamilton Bridge Works Company's Plant, Hamilton, Ont. It is a source of much pleasure to us to congratulate you on the excellence of this article and we are sure the same will prove very interesting to your readers generally."

* * *

United States Consul McWilliam reports from Sarnia, Ontario, that notwithstanding the depression in trade last year in both Canada and the United States, the total imports for consumption into Canada from the United States for the fiscal year 1908 amounted to $210,652,825, as compared with $208,721,601 in the previous year. Over 60 per cent. of Canada's imports come from the United States. Canada exported to the United States in 1908, $113,520,500, as compared with $109,772,944 in the fiscal year 1907. Thus, notwithstanding differential rates in favor of Great Britain and her colonies, the trade with the United States continues to increase.

* * *

The effort to secure reciprocity in bituminous coal between United States and Canada is unfortunately for both countries shelved. The Finance Committee through Mr. Aldrich reported an amendment to the United States Senate, fixing the duty on bituminous coal and shale at sixty cents per ton; on coal slack or culm, at fifteen cents per ton; coke and compositions used for fuel at twenty per cent. ad valorem. A drawback equal to the duty is allowed vessels in the foreign trade. The amendment left out the house reciprocity provision. Numerous attempts were made to reduce the rate, and there was one effort to obtain free coal, but all were voted down and the committee's scale retained. By a vote of fifty to twenty-eight, the amendment placing a duty of $1.50 a thousand feet on sawed lumber, with differentials on finished lumber was carried. This is fifty cents below the Dingley rates. The duty on clapboards was increased from $1 to $1.50 per thousand; on laths from 20 to 25 cents per 1,000 pieces and on shingles from 30 to 50 cents.

FOUNDRY PRACTICE AND EQUIPMENT

Practical Articles for Canadian Foundrymen and Pattern Makers, and News of Foundrymen's and Allied Associations. Contributions Invited.

CONVENTION SOUVENIRS.

A number of interesting souvenirs were given away by the exhibitors at the American Foundrymen's Association Convention held in Cincinnati in May. The accompanying photograph shows a few of the many that attracted attention at the convention.

1.—Member's Badge.
2.—Arcade Mfg. Co., Freeport, Ill.
3.—Millers' Products Co., Chicago, Ill.
4.—Excursion Badge.
5.—Guest's Badge.
6.—Millers' Products Co., Chicago, Ill.
7.—Joseph Dixon Crucible, Jersey City, N. J.
8.—S. Obermayer Co., Chicago, Ill.
9.—Cleveland Wire Spring Co., Cleveland.
10.—Pickands, Brown & Co., Chicago and Baird & West, Detroit.
11.—Taunton Crucible Co., Taunton, Mass.
12.—Jonathan Bartley Crucible Co., Trenton, N. J.
13.—Newport Sand Bank Co., Newport, Ky.
14.—Interstate Sand Co., Cleveland.
15.—Globe Metal Co., represented by S. Birkenstein & Sons, Chicago.
16.—Hawley Down-Draft Furnace Co., Chicago.
17.—J. W. Paxton Co., Philadelphia.
18.—J. S. McCormick Co., Pittsburg.

A few of the Souvenirs of the A.F.A. Convention, Cincinnati.

The Nipissing Central Railway Co., have let the contract for the construction of the electric road between Cobalt and Haileybury to the Nova Scotia Construction Co., of Sidney, C. B.

CONTINUOUS MELTING.*

By Richard H. Probert, Louisville, Ky.

In the continuous melting of iron in our foundry we operate two cupolas alternately. They are situated side by side, midway and at one end of the molding floors. They were made in our own shops, are drop bottom and of the same size and type. Their dimensions are as follows:

Height over all 30 ft. 6 ins.

Inside diameter, 30 ins., (lined).

Size of charging door, 1 ft. 6 ins. by 2 ft. 4 ins.

Five tuyers 4x5 ins. each.

Air or blast box 6 ft. by 2 ft. 4 ins. high.

Melting zone is 8 ins. above the tuyers and extends up for 20 ins.

From the bottom to charging door 9 feet.

From the top of charging door to top of stack 19 feet.

From bottom of slagging hole 12 ins.

From bottom of tuyers 20 ins.

Outside diameter of stack 42 ins.

Outside diameter from charging door to top of air (or blast) box 56 ins.

Outside diameter from top of air (or blast) box to base 68 ins.

The stack is lined with regular stock fire brick and from the charging door to the bottom is lined with cupola blocks 4-in. thick, 6-in. wide, 6⅞-in. inside radius and 9-in. outside radius. These blocks and the fire clay used with they are of the best make. From which we get excellent results. They are guaranteed to stand over 3,000 degrees F., are dense, hard, tough and very refractory, made from flint clay high in alumina. It is economy to use high grade material for lining from bottom to charging door, especially on continuous melting, as previously, the repairs, were very considerable over and above what it now costs—in fact, over double. The space between the shell and the lining is filled with grout. The last lining put in from the charging door to bottom was

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* This paper is presented and read before the Ohio Society of Mechanical Electrical & Steam Engineers, at Canton, Ohio, and the American Foundrymen's Association at Cincinnati, Ohio, at their meetings in May, 1909.

on November 2nd, 1907, and it is still in good condition.

Cupola Charging.

In addition to our continuous melting we make grey iron castings for machine, structural and other lines of work, which is put up on the regular sand floor. These castings are poured each morning before the continuous work is begun, The night watchman lights the cupola at 6 o'clock a.m., everything being got in readiness the previous evening. The first iron is tapped out at 7.20 to 7.30 a.m. The first charge of coke to heat up and form the bed amounts to 500 lbs.; we previously charged 900 lbs., but successfully reduced it to 500 lbs. Our charges are small in comparison to those of general foundry practice, but owing to the nature of the work and the continuous melting, the chaging of the cupola and frequency of the metal tapped out, all requires nice adjustment to prevent loss.

Melting.

The charge consists of 100 lbs. of coke and 500 lgs. of iron (about as follows: 100 lbs. machinery scrap, 250 lbs. pig and 150 lbs. remelt). The last three coke charges are usually 50 lbs., 50 lbs., and 25 lbs. Limestone will average about 2¼ per cent. to the total iron charged. On a day's run of 20 charges, limerock is commenced with the 5th heat and stopped off on the 15th. This has been closely followed up and no difficulty is experienced. Loss in melting is about 2½ per cent., deducting the finished castings and scrap cleaned up from total iron charged. Slagging commences regularly on or about 11 a.m. each day.

Cupola Repairs.

We daub up the cupola with swamp or blue clay mixed with fire-clay. The melting zone and bosh is repaired with one part swamp clay and two parts fire-clay, with small crumbs of fire brick.

Sand Bottom.

Sand bottom is made up from the siftings of the previous bottom, tempered with three shovels of new molding sand, slightly dampened and riddled. The bottom is stamped and rammed close with a close point of fire-clay around the edges. We make up the bottom as dry as possible, which is the best practice for small heats, as it does not chill the iron when first melted. The thickness is 3½ ins. at the level of the tap hole and slopes to 4¾ ins. thick at the back, this will give a slope of ½-in. to the foot. Figuring inside measurements, the slag hole is 8 ins. above the sand bottom, from the slag hole to the bottom of tuyers is 9 ins. and from the top of tuyers to the bottom of melting zone is 8 ins. with melting zone extending up about 20 ins.

Breast.

The breast is made with a fire brick, chipped, grooved, and beveled on the inside to one inch in thickness at the bottom side. The groove forms the tap hole, this brick is set in place with fire-clay. The spout is lined with two fire bricks end to end and grooved or channeled out, fitted, and daubed smooth with fire-clay.

Blast.

The blast pressure equals 6 ozs. and is regulated with a swing valve. The wind intake is 10x10½ ins.=105 sq. in., which exceeds the tuyers 5 sq. ins.,

Coke.

All our coke is kept perfectly dry being unloaded direct from the cars into storage bins built inside the foundry at the foot of runway to the cupola. Coke analysis:

Volatile matter	0.67
Fixed carbon	87.05
Ash	10.60
Sulphur	0.74
Phosphorus	0.016

Frame Running.

It is very important that the molding frames and molds be kept up to the highest state of efficiency so as not to cause delay in the pouring and the holding back of the iron in the cupola. The frame and mold capacity should a'ways be greater than the pouring capacity, which will permit of continuous work. The cupola tender must strictly watch his charges. He must not melt down too fast. The blast must be regulated so the heat is at all times fully known to him. He should keep in close touch with the work on the foundry floor and be ready to give or slack his metal as it is required by the men. Good common sense and strict attention to his duties are required to prevent chilled heats, over heating, and other losses. Slagging commences regularly each day about 11 a.m. The slag is allowed to accumulate until just below the tuyers. Our experience is that by leaving the slag to this height we get cleaner iron and better results from the blast. We open the slag hole just enough to let the slag run and by letting this gather in a crust on the outside of the slag hole, it acts as a trough and prevents the blast escaping out with the slag.

Molding Frames.

The molding frames for the permanent molds are either square or rectangular in form, but should always be carefully designed so the molds can be arranged on the frames to the best advantage for the work to be done. They can be made with flat bar iron cross and intermediate bars fastened to cast iron frame with solid cast iron trunions on each side, or a frame work of angle iron with cast iron trunions bolted to the sides with flat bar iron cross pieces to angle of frame work. This makes a much stronger frame. The molding frames are supported on cast iron stanchions set securely in an upright position in the molding floor, the top of each stanchion is made with an open bearing or journal fitted up to take in the trunnions on the ends of the molding frames. This allows the molding frames to revolve freely on the trunnions, as in operating a number of molds on one frame the pouring of the molten iron cannot always be done from the same side of the molds, the gates do not run in the same direction, consequently, some of the molds must be poured from the opposite sides to the others. The revolving frames can be turned to the best position and quickly fastened in place with a plain steel pin set into holes drilled in the end of one of the trunnions, to a lug or bracket on the stanchion below the bearing. For some work the molds on one side of the molding frame are much heavier and larger than those on the other side, which causes the frame to be top heavy and difficult to handle. This can be easily overcome by an arrangement of counter weights, adjusted so as to properly balance the frame. A circular revolving molding frame is very convenient and can be worked to advantage on standard lines of duplicate work, in which the molds are self-contained and separate unto themselves. Such an arrangement would permit of the iron pourer getting around his work quickly besides leaving sufficient room for more than one man to pour iron on the job at the same time.

Permanent Molds.

Our permanent molds are largely ornamental, some of them are made to hinge and are provided with a swivel clamp set into a lug on the side of mold for fastening the two halves together, others are not hinged and are fastened together with screw clamps or gib and key. Any arrangement made for the fastening of the mold together should be made so the same can be taken apart easily and quickly, as it is necessary to open up the molds as soon as poured, in fact while the casting is at a very bright red heat.

Castings that are unequally proportioned and uneven in their different parts will crack open and chip if allowed to cool in the molds. The molds are machined on the faces that close together so as to make a tight even joint, they are also machined on the bottom side that is bolted to the mold-

ing frame. They are drilled and tapped with the hinge pin properly fitted, so it is necessary to have them soft enough to permit of this machine work and fitting being done and still be tough enough and of the right grade of iron to stand up to the molten metal continuously poured into them. If they fail to do this and burn out quickly it is quite a loss of time and expense, delay in producing the work and the expense of remaking the molds. After some experimenting the writer found that molds with the following analysis gave fair results:

Sil	Sul.	Phos.	Mang.	Com. carbon	Graphite
2.15	.086	1.26	0.41	0.13	3.17

Molds made from iron with this analysis were worthless:

Sil	Sul.	Phos.	Mang.	Com. carbon	Graphite
3.30	.057	0.67	0.12	0.19	2.98

Molds that gave the best results were made from two special brands of No. 2 foundry pig (see their analysis marked No. 1 and No. 2.) Heavy machinery scrap and our regular No. 2 foundry pig.

No. 1—

Sil.	Sul.	Phos.	Mang.
1.50 to 1.75	.015 to .03	.18 to .20	.60 to .90

Strong iron.

No. 2—

Sil.	Sul.	Phos.	Mang.
2.25 to 2.75	.015 to .03	.40	.45

Fluid iron.

The charges were made up from:

Lbs.
150 No. 1 (analysis No. 1)
75 No. 2 (analysis No. 2).
100 our regular No. 2 foundry pig.
200 heavy machinery scrap.

525 pounds charge.

The analysis of the molds cast from this mix was:

Sil.	Sul.	Phos.	Mang.	Com. carbon	Graphite Car.
2.02	0.07	0.89	0.29	0.84	2.76

These cast molds are easily machined and do not burn for a reasonable length of time. Extra care is taken in molding them. We have success in using a molding sand made up from:

8 parts of old floor sand.
3 parts of new floor sand.
1 part of sea coal facing.
1½ parts of sharp sugar sand.

This with plumbago, a good parting and setting in the pattern again together, with careful melting by cupola tender, has given us the best permanent molds to date.

High Carbon Steel Mixed With Molten Iron.

Iron was taken from the above given charge, and 7 per cent, of tool steel turnings (fine lathe turnings) were mixed with the ladle and well agitated before being poured. The cast permanent molds from this are standing up well but have not had sufficient time to thoroughly test this mixture.

Quick Operation.

Continuous melting can be easily arranged for and with an equipment of over-head runways and hoists, the frames can be quickly changed. The molds on all frames can be previously gotten ready by the mold makers, so that very little time is lost in changing frames. It is advisable to have a few extra sets of stanchions for all preparatory work to be set up on them, thereby preventing delay.

Sticking of Iron in Molds.

A mixture of linseed oil and powdered soap stone or oil and graphite swabbed on the molds and gates each heat will prevent the castings sticking and prolong the life of the molds. The molds should be kept clean and when not in use stored away on shelves convenient to the molding frames. All our molds are classified and indexed in a mold book just as a well-arranged pattern storage loft.

Steel Molds.

We use high carbon steel molds that have sharp, thin edges on their inside. In constant use the steel in these molds roughs up, but does not eat away and burn off as the cast iron molds.

Casting Specialties.

By this process, with the proper mixture of metals carefully melted, and well made permanent molds that will stand up to the work required of them, with instant effective pressure on the molds as soon as the molten metal is poured into them, cast specialties can be made with increased strength. The pressure will make them non-porous, more dense in structure, which the annealing would not weaken but rather toughen. Subjecting some cast specialties to pressure would make them more suitable for the finer line of machine parts, as they would be pressed into better shape, be cleaner, and with their parts more clearly defined. An equipment for such added pressure can be easily made, and after first cost would be a slight expense in operation.

LARGE BRONZE CASTING

The Lumen Bearing Co., Toronto, have on several occasions made some very large castings in bronze but the pro-

Fig. 1.—Relative Size of Man and Propellors.

pellor illustrated in Fig. 1 molded recently by them is probably the largest bronze casting made in Canada. The size of the propellors may be judged by the man who is standing beside them. They are right and left hand propellors,

Fig. 2.—Pouring the Bronze into the Mold.

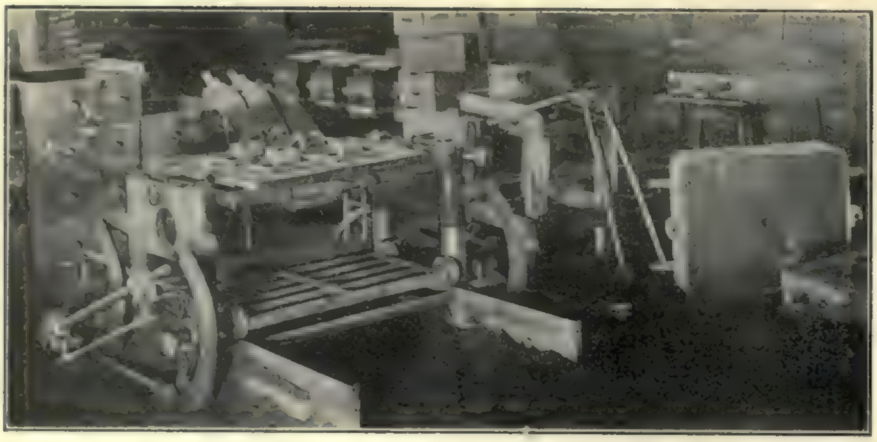


Fig. 1.—Murphy Roll-over, With Patterns in Place.

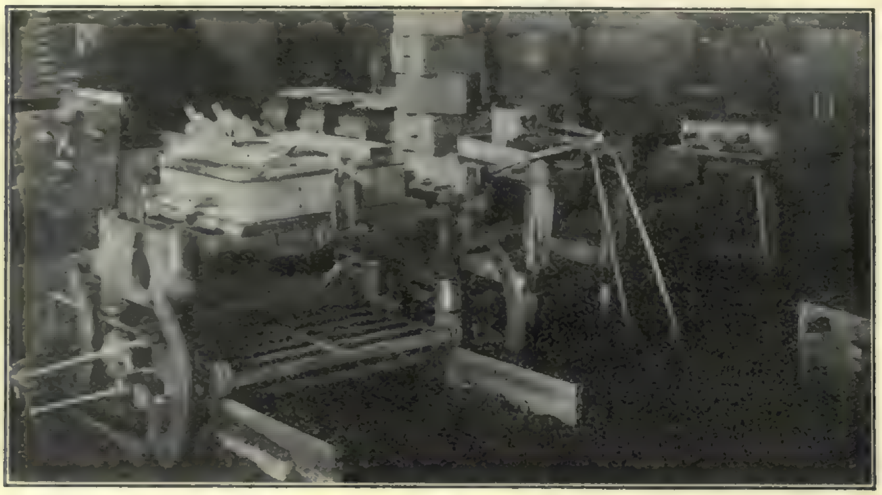


Fig. 2.—Drag in Place, Rammed up.

Fig. 3.—Mold Drawn Forward Ready For Lifting Off.

one weighing 1,587 lbs. and the other 1,595 lbs.

Fig. 2 shows the mold with everything in readiness for pouring. The cope of the mold weighed 7,200 lbs.

The propellors were for the Dominion Government Steamer Vigilant which was being repaired at Polson's Iron Works, Toronto. The Vigilant had the tips broken off both right and left propellors. Bronze propellors had to be obtained, bronze being lighter yet stronger than steel for a given weight.

The patterns for the propellors were made of aluminum and were cast by the Lumen Bearing Co. Each pattern complete weighed about 350 lbs. The blades and hugs were cast in separate pieces, each blade weighing about 103 lbs. A recess was formed in the hub and an iron ring was shrunk on, holding the blades to the hub. The steel ring fitted into the recess and formed a perfect part of the pattern.

A NEW ROLL-OVER MACHINE.

The accompanying illustrations show a new type of roll-over machine which has been developed by Mr. James A. Murphy, the foundry superintendent of the Hooven-Owens-Rentscheler Co., of Hamilton, Ohio.

This machine embodies a number of new and interesting features. In Fig. 1 the machine is shown with a gate of patterns attached ready to receive the drag. It will be noticed that the roll-over table is carried on trunnions at the ends and that those trunnions are supported by two iron yokes, each of which rests on two pistons. The roll-over device is located at the right of the machine and is not very clearly seen in Fig. 1, but it is shown more clearly in Fig. 3. In Fig. 2 the machine is shown with the drag flash in place rammed up and the bottom board clamped on ready for rolling over. After the flask has has been rolled over it is supported upon blocks as shown in Fig. 3.

This is accomplished by raising the roll-over table slightly, inserting the blocks, and then bringing the bottom board to rest upon these supports. For an adjusting device Mr. Murphy uses four pads made of sheepskin filled with curled hair, and he has found that these work very well indeed. One of the most interesting features of the machine is the fact that the pattern drawing device is operated first by hand and then by compressed air.

When drawing the patterns the lever shown at the left of the machine in Fig. 1 and Fig. 2 is lifted slightly and this starts the pattern and at the same time opens an air valve, admitting air through the stationary plungers into cylinders formed in the yokes on the ends of the machine. This air completes the lift and makes it possible to draw a heavy pattern very easily indeed. The mold is received on a small carriage which can be run forward from under the machine to facilitate the removal of the same.

In the case of the particular pattern shown on the machine in the illustration the cope is a small flat back which is rammed up by hand on a plate or buck, as shown at the right in Figs. 1 and 2.

INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News.

Foundry and Machine Shop.

The Deseronto Iron Co., at Deseronto, Ont., is again in operation.

The Riviere du Loup Electric and Iron Works at Fraserville, Que., is in liquidation.

Copper smelting works are promised for the Point Wolfe Copper mine at Newcastle, N.B., this summer.

A by-law has been carried at Pembroke to loan the Lee Mfg. Co. $30,000 for the purpose of building a foundry.

Negotiations have been closed by Industrial Commissioner Dowling for the establishment of a new foundry at Brantford.

About 1,000 men are employed by McClary's in London making gas ranges and about 250 in their different warehouses throughout Canada.

The Sydney Foundry & Machine Co., Sydney, N.S., have ordered a Force Feed Pump from the Smart-Turner Machine Co., Hamilton, Ont.

The Nova Scotia Steel Co. propose to make improvements to their plant, but what these will be have not yet been definitely decided upon.

The contract for building the new machine shops for the C.P.R., at West Toronto, has been awarded to Bishop & Buchanan, Peterborough.

The Grand Trunk are at the present time handling between 90 and 100 cars of ore on an average every day between Point Edward and Hamilton.

The proposed rolling mill enterprise at Sydney will be underwritten by F. B. McCurdy, Halifax, who has launched a number of other industries.

The foundry at Wiarton, Ont., owned by G. S. Sinclair & Sons, was destroyed by fire on June 13. The loss is very heavy, with only $1,500 insurance.

The Dixon Bridge Works Co. are looking for a suitable place in the west for the location of a branch of their business. Port Arthur has appealed to them.

The Pictou Foundry & Machine Co., Pictou, N. S., have recently ordered from the Smart-Turner Machine Co., Hamilton, a Combined Air and Circulating Pump.

The Dominion Iron and Steel Company's output for April was as follows: pig iron, 22,402 gross tons; steel, 25,050 gross tons; total shipments, 19,000 gross tons.

The staff of the rod mill of the Dominion Iron and Steel Co., at Sydney, has been put on double shifts. This means that the output for the summer months is to be doubled.

Woodside Bros.' foundry at Port Arthur, is working day and night to get out the work coming in. The firm has a contract for building 36 tram cars for G.T.P. construction at the head of Lake Nepigon.

The R. Watt Machine Works, Ridgetown, Ont., are getting out two carloads of machinery to go to the Northwest as a result of Mr. Watt's recent trip there. Many extensions and improvements have been made to the works.

The by-law fixing an assessment of $5,000 for a period of twenty years upon the proposed plant of the Waterloo Mfg. Co., manufacturers of threshing machinery, of Waterloo, Ont., has been passed by Portage la Prairie citizens.

E. F. Bonsall is laying his plans to install a first class foundry plant and machine shop at Cobalt in addition to the present Bonsall Machine Shop. Every modern detail of equipment and a thoroughly up to date shop will be put in.

The Drummonds have accepted the offer of a free site from the town of Newcastle, N.B., and will commence shortly to build docks there for shipping their ore. A branch line is to be built from the mines to the Intercolonial at Black's Cut, about four miles south of Bathurst.

The industrial committee of the St. Thomas council are considering the prospects of securing an industry manufacturing an attachment to reaping machines. The company is not asking for a bonus, simply a sufficiency of land on which to place their buildings and a few other concessions.

The annealing furnaces of the Canadian Sheet Metal Corporation at Morrisburg, are being dimantled and larger ones substituted. Two additional rolling mills are being set up. The galvanizing plant is to be rebuilt with a larger capacity, and a roofing plant will be added to the equipment.

The machine shops of the Dominion Coal Co. are busy at present, and a large staff are kept continually at work. There are several engines in for general repairs and a very large amount of general repair work on colliery machinery, etc. The busy season in all departments of the company's works has now actually commenced.

The town council of North Sydney, has granted a free site, free water and exemption from taxation for a period of thirty years to J. H. Brown, of Montreal, a mining engineer, and his associates, to erect a reduction and smelting plant for the smelting of ores, the plant to cost in the vicinity of one million and a half dollars.

The Burrill Foundry Co. has reorganized under the name of the Brantford Foundry and Development Co., with a capital stock of $40,000. The members of the firm are H. G. Burrill, J. B. Rouse and W. R. Burrill. Besides foundry work, a machine shop will be added, and the plant at Grey Street will be remodeled and enlarged.

The Edmonton Iron Works of Edmonton, Alta., are building a new and much enlarged plant 200 x 66. The company found it necessary to do this in order to take care of the structural steel work which they had to do. The new building will be entirely fire proof and of steel construction. They are general machinists, iron and brass founders, and also do boiler work and will make a specialty of structural steel work.

Londonderry, N.S., is to have a steel plant, and preparations for their erection have begun. The site has been selected and work on the foundation will be started at once. It is the intention of the company to build a small steel casting plant of about five tons capacity, for a beginning, this to be increased later should the demand for the output warrant it. For this purpose a brick building with steel frame will be erected, 100 feet in length and 50 feet in width, with an addition or lean-to thirty feet wide. The company also intend to put in an electric lighting plant, with sufficient power to light all their works, and with a view to extending the benefit to the rest of the town as soon as needed. A large amount of capital has been invested in the property.

Municipal Enterprises.

A waterworks system is proposed for Oxbow, Sask.

Owen Sound ratepayers carried the waterworks by-law.

The extensions to Hull's waterworks system are estimated to cost $18,000.

Galt & Smith, Toronto, have been engaged to report on a sewage disposal scheme for Nanton, Alta.

By a majority of 84 the by-law to raise $20,000 for a system of waterworks at Gravenhurst was carried.

The B. C. Government and the G.T.P. are arranging to instal a new waterworks system at Prince Rupert.

Battleford, Sask., business men are asking for a fire protection system. Such a one would cost about $30,000.

The Barrie Council have reported in favor of submitting a by-law to raise $30,000 for sidewalks and sewers.

Tenders are invited by the Peterboro Water Commissioners for extensive work in connection with the waterworks.

The by-law to raise $25,000 to repair and complete the Carman, Man., waterworks system was carried by a large majority.

James Heatley's tender for the construction of extensions to the Brampton water works system was accepted, it being the lowest.

Fernie, B.C., ratepayers have approved a by-law to raise $100,000 for the purchase of the present waterworks system and extensions thereto.

The contract of Carriere & Wilson for the extension of the Hull waterworks to cost about $7,000, was confirmed at a recent meeting of the city council.

The plans submitted for a waterworks system at Markdale will be passed by the Provincial Board of Health after a few amendments have been made.

Engineer Childs, of Calgary, Alta., has completed his report on proposed gravity water system and estimates the cost at $290,090, exclusive of reservoir.

The by-law to raise $10,000 for water extensions at Kamloops received its preliminary readings. On motion of Ald. Brown the amount was increased to $15,000.

The Victoria city engineer's department is now preparing plans for a new incinerator to cost about $2,000 and capable of consuming twenty tons of material per day.

The report and plans prepared by T. Aird Murray, C.E., Toronto, for a sewerage disposal system for North Toronto, were recently accepted by the Provincial Board of Health.

The John McDougall Caledonian Iron Works, Montreal, was awarded the contract for the steam centrifugal pump for the filtration plant by the Toronto Board of Control at $9,428.

A trunk sewer will be built on Pacific Avenue, Eighteenth Street and Rosser Avenue, Brandon. Work will commence on it at once and when it is completed $47,600 will have been expended.

The Montreal roads committee have sent in requisitions for $2,500,000 for public work, to be completed this summer. Included in this amount are sewers, $133,000; pumping plant, $55,000.

Aylmer is willing to pay one-third of the cost for the installation of septic tanks in connection with her sewerage system, provided that Ottawa and Hull bear the remaining two-thirds of the amount.

A new waterworks system to supply Prince Rupert will shortly be installed. Negotiations at present are proceeding between the provincial government and the G.T.P. with regard to the financial arrangements.

At a recent meeting of the Moose Jaw council, a by-law was introduced to raise $40,000 for the construction of a reservoir at Snowy Springs, and for improving the means of bringing the water to the city.

A New York syndicate has bought a water power on the Matabitchouan River to supply the mines in the vicinity as well as the electric railway which is to run from Cobalt to the head of Lake Temiskaming.

As a result of the negotietions which have been carried on during the past month between the city and the Esquimalt Water Works Co., the city will make an offer to the company for its undertaking at Goldstream.

The contract for the instalation of the Yorkton, Man., waterworks system has been awarded to the Municipal Construction Co., of Regina. The Municipal Construction Co. has also been awarded the contract for the Estevan waterworks, amounting to $11,455.

Work has again been commenced on Montreal's big new waterworks conduit, which runs from Lachine to Montreal. As soon as the work is completed the Water Committee will call for for tenders for the laying of the "intake" pipe at Lachine, away out into the middle of the St. Lawrence.

The contract for supplying Kamloops with water pipe has been awarded to an English firm, the agents of whom are the Burton Saw Co., Vancouver. There were many tenderers for the pipe, the price of the English firm being $45.10 per ton of 2240 pounds f.o.b., Kamloops. The contracts for the hydrants, valves and boxes will be awarded later.

Engineer Dutcher and Superintendent Wain, of Kamloops, decided to award the contract for the engine and dynamos for the power plant to the Canadian Westinghouse Co. and for the boiler and condensor to the Canadian Fairbanks Co. The work of installing the new machinery will be undertaken very shortly and it is hoped to have the new plant ready in the course of three months.

Following were the successful tenderers on Toronto's filtration plant: Main contract, Messrs. Dill, Russell & Chambers, $568,128.60; cast iron

pipe and specials, Canada Foundry Co., $10,891.70; gate valves, Ludlow Valve Co., Troy, N. Y., $8,772.95; sluice valves, Coffin Valve Co., Boston, $85,209; Nenturi meter castings, John Inglis Co., $2,891; Nenturi meter indicating apparatus, John MacDougall Caledonian Iron Works, Montreal, $3,318; sand washer castings, Canada Foundry Co., $871.20; steam centrifugal pump, John MacDougall Caledonian Iron Works, $9,484; screw pumps, Allis-Chalmers-Bullock Co., $7,049; electrically-driven stage pump, Allis-Chalmers-Bullock Co., $5,234; drainage pump, John Inglis Co., $1,600; boilers, John Inglis Co., $2,750; manhole casting, Canada Foundry Co., $8,890.35.

Railway Construction.

The C.N.R. propose laying 600 miles of new track this season in the west.

Construction work has begun on the electric line that will connect Cobalt and Haileybury.

The Niagara, St. Catharines and Toronto electric road propose extending their line from Welland to Port Colborne.

The Grand Trunk Railway has bought 700 tons of steel rails from the Pennsylvania Steel Co., for its United States lines.

Extensions of the C.W. & L.E. electric line now connecting Chatham with Wallaceburg, on the north, and Lake Erie on the south are contemplated.

Contracts will be let soon by the Dunnville, Wellandport & Beamsville Electric Railway, which propose to build a 22 mile electric railway to connect these three towns. It is proposed to begin work at once.

In connection with construction work on the Saskatoon to Calgary branch of the C.N.R., the grading gang have begun operations southwest of the former city and it is expected that steel-laying will be started very soon.

It is estimated that $85,000,000 will be spent on actual railway construction work in Western Canada this year. Of this amount the C.P.R. plans to spend $20,000,000; the J. J. Hill lines, $15,000,000; the C.N.R., $11,000,000; and the G.T.P., $10,000,000. There are a number of newer lines also under charter, which propose to build.

General Superintendent Price, of the Canadian Pacific, states that contracts have been let for work on six branch lines in the western division, involving the construction of about 270 miles of new track. The lines include that running east from Hardisty, one east from Stettler, one north from Cheadle to Alix, one from Kipt to High River, all in Alberta, and one west from Weyburn, Sask.

The C.P.R. is laying about 17 miles of new rails on the Atlantic division, replacing those of lighter weight. The new rails, which are the product of the Dominion Iron & Steel Co., are 5 pounds heavier than the ones formerly used, being 85 pounds to the yard. The rails removed from the main line are being used on the branches, and in all 53 miles of track will be laid this year and about 30 or 40 miles of ballasting will be done.

The most important of the new C.N.R. lines to be built this season is an extension from Vegreville to Calgary, 235 miles. Other new branches are: An extension from Maryfield, Sask., southwesterly one hundred miles; extension from Russell westward twenty-five miles; from Prince Albert, thirty miles west; from Ochre River, through St. Rose du Lac, a distance of twelve miles, a branch line twenty miles north; and from Oak Point, a branch twenty miles north from Morinville.

Structural Steel.

Tenders will be received for a steel bridge with concrete piers and abutments at Arnprior.

Over $20,000 will be spent in improving roads and bridges in Waterloo county, Ont., this season.

The C.P.R. have started operations on the Wellington Street viaduct at Ottawa. It is to cost $75,000.

The contract for the Edmonton power house structural steel was given to the Edmonton Iron Works for $16,460.

Tenders will be received for erection of a one span steel bridge, 115 feet in length, over the Bayfield river at Clinton.

The contract for spans for the new Beaudette and Island bridges near Cornwall was awarded to the Hamilton Bridge Works Co.

Tenders have been awarded by the Aylmer, Ont., town council for the new bridge at Myrtle Street to Stratford Bridge Co.

A contact has just been closed with the Hamilton Bridge works for a steel and concrete bridge across the Neebing river, near Fort William.

The Manitoba Bridge Works, Winnipeg, will supply the iron work used in the construction of the Transcontinental Railway shops at that city.

The Dysart Township council have let the contract for a steel bridge to be placed over the river at Stewart's narrows, near Lindsay, to Jenkins & Dresden, Sarnia. The cost will be in the neighborhood of $3,000.

The contract for the construction of a new steel bridge across the Salmon river at Chipman, N. B., has been awarded by the Department of Public Works to the Dominion Bridge Co., Montreal. Estimated total cost, between $27,500 and $30,000.

The Manitoba Bridge and Iron Works, Winnipeg, have been awarded the contract for the structural steel for the Great West Life Assurance Co.'s building at Winnipeg, amounting to 650 tons. This building will be a large one of steel construction designed for five additional stories. This is the second largest contract for steel building construction in Winnipeg awarded this year.

Contracts for the construction of five new bridges in northern Ontario have been let by the Provincial Public Works Dept. They represent an expenditure of about $40,000, and must be completed by Oct. 1. The names of the contractors and cost of the work are as follows: Bridge over the Vermilion River at Whitefish, on the new Sudbury-Sault Ste. Marie road, to cost about $15,000, Dixon Bridge Co., Campbellford; bridge across the Spanish River at Nairn, Algoma District, cost $12,000, contractors for steel superstructure, Dixon Bridge Co.; Murdoch River bridge, Nipissing District, $3,500, M. A. Pigott & Sons, of Hamilton; Courchasse Bay bridge, about $3,500, William Doust, Cosby Township; bridge over Wabigoon River at Dryden, cost $6,300, Morrow and Beatty, Peterborough.

Planing Mill News.

A veneer mill is to be erected at Mansonville, Que.

C. Jobin & Co. will erect sawmills at St. Augustine, Que.

C. H. Dickie, of Duncans, will build a lumber mill on Quamichan Lake, B.C.

Donald Fraser & Sons' lumber mill at St. Frances, P.Q., was burned recently.

Gignac, Beland & Co.'s sash and door factory at Quebec was burned recently.

The Mundy Lumber Co.'s mill at Vancouver, was burned lately at a loss of $200,000.

A $20,000 addition will be put up at the Arrowhead Lumber Mills, Kamloops, B.C.

The Yale Columbia Lumber Co.'s sawmill at Title, B.C., was destroyed by fire last month.

The Prince Albert saw mills have started operations. Seven hundred men are given employment.

Geo. Wood & Son's planing mill at Dundalk, Ont., was damaged by fire about the middle of June.

F. D. Rorison & Son, are building a saw and shingle mill near Eburne, B.C., at a cost of $100,000.

R. J. Watson, formerly of Burke's Falls, Ont., is building a sash and door factory at Revelstoke, B.C.

J. H. Lavelle and W. J. Hickey, are about to start work on a new box factory at Welland, Ont.

The Frader River Lumber Mills are constructing a logging railway in Vancouver that will cost $150,000.

Shepard & Morse's sawmill, Ottawa, which has been closed for some time, has resumed operations at full capacity.

The Maycock, B.C., Lumber Co.'s plant at Cranbrook, was recently destroyed by fire at a total estimated loss of $100,000.

The Lewis Furniture Co. has purchased the old Royal Furniture Block at Winnipeg, and will make extensive alterations to same.

L. B. Smith's saw mill at Baillie station, three miles from Fredericton, was destroyed by fire last week at an estimated loss of $4,000.

J. H. Preston is increasing the capacity of the planing mill at Medicine Hat, recently taken over from the Medicine Hat Lumber and Mfg. Co.

Plans are being made by Frank Huston for the construction of a sawmill and planing mill in Vancouver. Both mills will be operated by electricity.

In a disastrous bush fire which occurred recently the Carlin & Carrigan sawmills on the Salmon River, B.C., were destroyed by fire. The former was valued at $75,000 and the latter at $35,00.

The Beveridge pulp mill in Lower Derby, N. B., which already employs one hundred and fifty men is being extended by the addition of a couple of wings.

The Nordin Co. will build a large up-to-date woodworking factory and lumber mills at Tide Head, near Campbellton, N.B. A large quantity of machinery has been ordered from Sweden.

The Great West Lumber Co. started their night shift at the Red Deer mill lately, but are still a little short of men. A new 75 horse-power engine will supply power in the planing department.

R. J. Watson, Dominion Government Timber Agent, is erecting a sash and door factory in Revelstoke, B.C. The management of the factory will be in the hands of his son, Gordon Watson and O. West.

The James Smart Mfg. Co., Brockville, has purchased the planing mill of John Briggs & Sons, in that town and will run it in connection with their own. The business will be reorganized and enlarged.

Dickie & McGrath's big lumber mills at Tusket, N.S., together with two million feet of lumber, were completely destroyed by fire recently. The cause of the fire is unknown. The loss is fifty thousand dollars, on which there is $25,000 insurance.

A. MacLaren, president of the North Pacific Lumber Co., whose mills at Barnet, B.C., were recently destroyed by fire, states that the erection of a more modern mill will be begun immediately. The new mill will cost about $350,000.

The Northumberland Pulp Co., Campbellford, are asking the Seymour Township Council for a fixed assessment of $2,000 on a pulp mill which it is stated they will erect near Ronney Falls. The company ask for a fixed assessment for 10 years, and it is said will undertake to erect buildings and works at a cost of $10,000.

A large lumber and shingle mill is to be erected at Esquimalt. A very good location has been secured and a spur line will connect the mill with the E. & N. Ry., which passes close to the site. The first outlay will be somewhere between one and two hundred thousand dollars. Another mill is also to be built by C. H. Dickie on Quamichan Lake and will tap a very large timber country.

The lumber mills of Vancouver Island are now finding it necessary to operate their plants continuously to their full capacity. The Genoa Bay Mill, owned by the International Lumber Co. is preparing to open up after being shut down for twelve years. Much the same condition of affairs is apparent elsewhere. At Shawinigan and Cowichan Lakes the mills are exceedingly busy, much more so than has been the case for many months.

Building Operations.

The Brantford Emery Mfg. Co. proposes to erect a new plant.

A. E. Wry Co., of Sackville, N. B., propose erecting a boot and shoe factory.

Construction will soon commence on the new D. W. Black cleaning elevator at Fort William.

The new Consolidated Elevator at Fort William will be erected by the Canadian Stewart Co.

Permits has been issued to the Twin City Co., Edmonton, for a $15,000 factory and warehouse.

The construction of the Dain Mfg. Co.'s plant at Welland will be begun at once and completed this year.

W. A. Edwards has been granted a permit for additions to the premises of the Frost Wire Fence Co., Hamilton, at a cost of $10,000.

The by law to loan John A. Minchner and others $20,000 for 20 years for the erection of another furniture factory was submitted to the ratepayers of Strathroy and carried by a large majority.

The Ogilvie Co., have made a contract with the Barnett McQueen Co., of Fort William for the construction of a 300,000 bushel grain elevator to be built next the company's mill at Winnipeg.

The contract for the new Harold-Sanderson refrigerator and screen door factory at Paris has been awarded to J. D. Tindale, Ingersoll, and the work of construction will be commenced immediately. The cost of the new buildings is between twenty-five and thirty thousand dollars.

A big elevator company has been organized in Calgary with a capital of $600,000. The company will build a large elevator capable of holding a million bushels, and the company expects to have 250,000 of this storage ready for use this fall. Work has already been started on the elevator.

The Canadian Stewart Co., one of the most recent of the big contracting companies in the U. S. to come to Canada, are employing over 700 men on the G.T.P. elevator at Port Arthur. Amongst other elevators which are contemplated by the Stewart Company is the construction of the Ogilvie Milling Co., who intend building another large elevator to add to their Fort William plant.

Nineteen new grain elevators are to be built in Alberta this summer, and work is to commence in about two weeks' time. The elevators will be built by the National Elevator Co., of Buffalo, which is extending its operations into Western Canana. The points decided upon are Macleod, Granum, Claresholm, Staveley, Nanton, Cayley, High River, Crossfield, Carstairs, Red Deer, Alix, Erskine, Stettler, Camrose, Bawlf, Daysland, Killam, Strome and Sedgewick.

Fort William, already famous for its elevators, seems destined to become still more famous for in addition to the large elevators already in course of erection by the Grand Trunk Railway Co. the Consolidated Elevator Co. are making preparations for the erection of another house in the vicinity of the present one at Westfort and a company headed by Mr. D. W. Black is negotiating for a site on which to erect a cleaning house. A little to the west of the Consolidated elevator the walls of the Western Elevator are beginning to show above the ground.

General Manufacturing Notes.

The Otis-Fensom Elevator Co., will enlarge its plant at Hamilton, to give employment to 600 men.

Fire caused $7,000 damage in the furniture factory of Isodore Pauin, at Hull. The building was gutted.

The Western Dry Dock and Shipbuilding Co., have decided to locate at Port Arthur. They will employ 300 men.

The Canadian Stonewood Flooring Co. is opening up a factory in Winnipeg for the manufacture of plastic flooring.

Schultz Bros., Brantford, will enlarge their plant and add to their lines the making of motor and portable houses.

The mill and basket factory of Merritt Bros., at Abingdon, Ont., was destroyed by fire last month at a total loss of $12,000.

Geo. Clare, M.P., is at the head of a company which proposes to operate a plant at Preston for building automobiles.

James W. Woods, Ottawa, has made arrangements for establishing a plant in this city for manufacturing tents and builders' supplies. Mr. Woods states that the factory will employ 500 hands.

The St. John Board of Trade are negotiating with Bonnel & Hardy, of London, Eng., who are looking for a site for the erection of a large paper mill.

H. Stead and B. W. Sparks have purchased a Vancouver waterfront lot from that city with the intention of starting a shipbuilding yard in the near future.

The English company which has bought the oil wells at Memramcook, N. B., are working their property at Legere's Corner, McGinley's Corner, and Guildville.

Inside of two months time Port Arthur expects to have the biggest stone cutting plant in Canada. The Stanworth, Martin Co. will greatly enlarge its present plant.

With a large local demand for pipe for irrigation purposes, E. T. Bogart, of Vancouver, will establish a factory to manufacture all kinds of wood pipe at Kelowna.

The Winnipeg Excelsior Mills is a new company just formed for the manufacture of excelsior or wood fibre for packing. It will erect a plant with a capacity of six tons daily.

One of the most costly fires in the history of Winnipeg was that of the Great West Saddlery Co. which destroyed property valued at about $375,000, less than half of which is insured.

Architect Darrach is preparing plans for a cement roller mill for S. V. Wilson, of Union, Ont., to be erected on the former site. The mill will be modern in every respect, and will be operated by water power.

A number of Pittsburg capitalists are considering London as the possible site of a large manufacturing concern. The plant when established will be a large one, employing 600 men. The authorities refuse to divulge the name of the company.

Alexander Morris has purchased from the National Mfg. Co., Pembroke, the site of their factory which was destroyed by fire last November. Mr. Morris has in contemplation the starting of a new industry which will employ quite a number of hands.

The Palmer piano factory at Uxbridge erected a little over a year ago, and which has been unoccupied since the failure of that company, has been sold by the town to a company being formed in Toronto with a capital of $25,000 to manufacture caskets.

E. W. Backus, who is interested in the establishment of a pulp mill at Fort Frances, Ont., stated that a company, which formerly operated a large flour mill at Montevideo, Minn., and which had lost everything by fire, were thinking of locating in Fort Frances.

Brantford's industrial commissioner has entered into communication with the Stanford Steel Range Co., of Norfolk, Virginia, which is desirous of establishing a Canadian plant. Prospects seem bright for its location here, where there are already several similar factories.

Electrical Notes.

Regina will spend $78,000 for electric light purposes.

Bridgetown, N. S., will instal a new system of lighting.

The municipality of Albert, Man., has voted in favor of a municipal telephone system.

The Dominion Coal Co. will equip its colliery at Glace Bay, N.S., with an electric plant.

The ratepayers of Claresholm, Alta., have passed a by-law to raise $20,000 for a lighting plant.

The Foster Rural Telephone Co., Abernethy, Sask., has been incorporated with a capital of $5,000.

The Central Ontario Power Co.'s offer of power at $7.50 per h.p. to Peterboro will likely be accepted.

Engineer P. W. Southam recommends the purchasing by the Waterloo, Ont., council of the local lighting plant.

The ratepayers of Shelburne, N.S., have decided to instal an electric lighting and power plant at a cost of $30,000.

Hamilton ratepayers carried the Hydro-Electric by-law by a majority of 610 and turned down the Cataract agreement by a majority of 185.

The rural municipality of Wallace, Man., has passed a by-law to raise $20,000 for the construction of telephone lines within the municipality.

The Great Falls Power Co. desires to make a contract with Portage la Prairie for the supply of power at $21 per h.p for a period of 50 years.

M. Conroy, of Aylmer, Que., representing a power development company on the Gatineau river, has offered to supply Brockville with 20,000 h.p.

McGill University, Montreal, is to instal a large power plant, to furnish steam heat and electric power to all of its buildings. The plant will cost $150,000.

The Seymour Power & Electric Co. want to sell power wholesale to Peterboro. They will be able to develop 4,000 h.p. in August and ultimately 20,000 h.p.

Hamilton city council has accepted the offer of the Hamilton Electric Light & Power Co. to furnish electricity for the illumination of Gore Park until September 30 for $550.

The Toronto Board of Control has awarded the contract for lighting the newly annexed district of Wychwood to the Toronto Electric Light Co. at a rate of $69 per lamp per year.

The Thamesville Telephone Co. has been incorporated with a capital of $10,000. The provisional directors are: W. J. Mitton, Camden; T. Marven, J. Coutts, Thamesville, Ont.

The Canada Mining Co., a company capitalized at 250,000 recently organized by P. H. Moore, of Bridgewater, for the purpose of developing power for mining purposes from the Salmon Falls on the Medway river, N. S.

Fernie city council has accepted tenders for the construction of pole line distribution and machinery, also for the removal of the machinery from Coal Creek and its installation in Fernie, in connection with the municipal electric light system.

Provision is made for additional construction and enlargements, amounting to $4,000,000, to the Canadian Niagara Power Co.'s plant by a bond issue of $25,000,000 authorized by the stockholders of the Niagara Power Co., the parent company of the Canadian Niagara Co.

The Alberta Government has entered into an agreement with the Automatic Telephone Co., Chicago, Ill., to instal automatic telephone systems in East Calgary and Lethbridge. It is understood that similar equipment will be placed in other cities in the province during the summer.

The first units of the great hydraulic power plant at Fort Frances, will likely be turned on early in August next. Orders have been placed for a quarter of a million dollars' worth of machinery, and in addition to this $150,000 worth of electrical apparatus has been contracted for.

The Western Canada Power Co. is the title of the corporation which has taken over the works and assets of the Stave Lake Power Co., Vancouver. The company will have a capitalization of $5,000,000. It is backed by Montreal men among whom are a number of the strongest capitalists in Canada.

The Great Falls Power Co. plans to distribute electrical power to the amount of 180,000 horsepower in Manitoba. They have acquired falls on the Winnipeg River that give a total head of 50 feet. The company has backing to the extent of $600,000. The transmission lines already plotted cover 63 towns.

The Goat River Power & Light Co., Creston, B. C., proposes to construct a power plant on the Goat River Canyon and will furnish electricity for lamps and motors and other purposes. The company also plans to construct an electric railway to extend from Creston to the Goat River, ten miles in length, work on which will commence within a year. R. S. Lennie, of Nelson, B.C., is president.

It is given out on good authority that the settlement out of court in the action against the Electrical Development Co. brought by the Niagara Construction Co. for flooding of its plant at Niagara Falls, consisted of a payment by the Electrical Development people of $15,000. The Construction Co. claimed $109,000, and the Electrical Development Co. offered $10,000, and finally $15,000, which was accepted.

Rodolphe Forget, M.P., who is the moving spirit in a big Quebec merger scheme, which will include electric, gas and street railway companies of that city, with a capital of $5,000,000, when asked for further details as to the new merger, said that it was the intention of the gentlemen in control of the Quebec Street, Power & Light Co. to make it one of the best corporations of its kind in the country.

The electric light superintendent has intimated to the Regina council that unless the new generators which it is proposed to instal are in position by September, it will be necessary to consider refusing to make new connections with the city's lighting system, or else to curtail the street lighting during the early evening hours in the fall, when the load upon the power house plant is heaviest. At the present time the plant is working in excess of its capacity.

D. W. Yates, Hydro-electric Commission's engineer has submitted to the city council of St. Thomas the estimates of the cost of constructing a plant for the distribution of Niagara power. For an entire new plant for all purposes his figures were $83,620, with alternate propositions which would mean the remodelling of the present plant for $82,810. The council decided to accept the former proposition, and will ask the ratepayers to sanction the expenditure.

The directors of the Northumberland-Durham Power Co., have announced that the Minister of Railways and Canals has agreed to grant a lease to the company of the remaining portion of the Healey Falls waterpower controlled by the Federal Government. Development of the power will proceed concurrently with the construction of the Trent Valley canal which passes through the Company's property, and will also facilitate the early construction of the Cobourg, Port Hope and Havelock Electric Railway.

The Manitoba telephone commissioners have completed plans for the season's programme of building and extensions which will mean the expenditure of $750,000 and the addition of 5,000 subscribers to the system in Manitoba. $250,000 will be spent in Winnipeg upon a new exchange for the western part of the city; for the extension of aerial and underground cables, and also the necessary extensions to be provided for the Main Street and Fort Rouge exchanges. There will be $250,000 expended on rural lines, and $250,000 on long distance lines.

Contracts for the construction of the municipal electric light plant at Lethbridge have been awarded as follows: For mechanical draft and economizer to the Polson Iron Works, Toronto, Ont., $6,890; complete piping, Drummond, McCall & Co., Montreal, Que., $14,365; for crane to Mussens, Limited, for $1,706; boilers and accessories to the Babcock & Wilcox Co., Montreal, $25,410; feed pumps to the Canada Foundry Co., Toronto, $730; transformers to the Northwest Electric Co., Calgary, $1,320; electrical equipment to the Canadian Westinghouse Co., Hamilton, $1,449, and to Laurie & Lamb, Montreal, for engine and condensing sets for $18,575.

New Companies.

Canadian National Carbon Co., Toronto; capital, $20,000; to manufacture carbon in all its various forms. Incorporators, B. Osler, A. G. Ross and J. F. H. McCarthy, Toronto.

Bruce Mines Saw Mill Co., Bruce Mines; capital, $60,000; to engage in sawmilling business. Incorporators, F. H. Lawrence, J. L. O'Flynn and G. W. Goodwin, Sault Ste. Marie.

Blangas Co. of Canada, Montreal; capital, $5,000,000; to manufacture gas, electricity and illuminants for light, heat and power. Incorporators, J. A. Jacobs, S. W. Jacobs, and A. R. Hall, Montreal.

Canadian Ensign Co., Hamilton; capital, $150,000; to manufacture the "Ensign Electrical Calculating Machine." Incorporators, E. S. Ensign, and F. R. Hardenberg, Boston, and R. Rocher, Waltham, Mass.

The Northern Light Power & Coal Co., Dawson, Y. T.; capital, $3,000,000; to carry on business as light, heat and power company. Incorporators, E. H. Thurston, London, Eng.; A. Haydon, and W. C. Greig, Ottawa.

The Erindale Power Co., Toronto; capital, $250,000; to carry on business as contractors, and hydraulic and electric engineers. Incorporators, E. S. Edmonson, and H. Waddington, Toronto; and Chas. Holt, London, Eng.

The Sault Ste. Marie Dry Dock and Shipbuilding Co., Sault Ste. Marie; capital $1,000,000; to construct and operate dry docks, marine railways, etc. Incorporators, Jno. O. Boyle, W. H. Plummer and Wm. O'Brien, Sault Ste. Marie.

Gas Items.

The Gas Traction Co., will erect a plant to manufacture gasoline engines in Elmwood, Winnipeg. Cost $75,000.

Glencoe, Ont., is installing a 100-horse-power Hornsby-Stockport suction gas engine unit for street and domestic lighting.

The City Gas Co. is prepared to deliver natural gas in London, just as soon as a proposition that would meet with the citizens' indorsation is presented.

The Calgary Natural Gas Co. has decided to begin work immediately on a second well near their present well, and the order has already been given for the machinery.

The Goold, Shapley & Muir Co., Brantford, installed an 8 horse power gasoline engine at that city's waterworks to replace the windmill wrecked in the storm a few weeks ago.

A number of Detroit capitalists recently visited Sarnia and had a consultation with representatives of the Gas & Electric Light Co., relative to supplying the town with natural gas. It is the intention of the promoters of the scheme to pipe natural gas to Sarnia from the oil and gas fields near Tilbury and deliver it to the local company for distribution to patrons. The cost of bringing the gas to the town would be in the neighborhood of three or four hundred thousand dollars.

Trade Notes.

The Kerr Engine Co., Walkerville, have been awarded the contract for the iron gate valve for the Cobalt Hydraulic Power Co., Cobalt.

Fifteen carloads of engines and threshers, valued at $20,000, were sent out one day recently from the John Goodison Thresher Works, Sarnia.

The Smart-Turner Machine Co., Ltd., Hamilton, have recently supplied the Corporation of Owen Sound, with one of their Centrifugal Pumps.

The Seymour Power & Electric Co., Campbellford, are installing a pair of direct connected motor driven Centrifugal pumps built by the Smart-Turner Machine Co., Ltd., of Hamilton, Ont.

The Banwell-Hoxie Wire Fence Co., Hamilton, have contracted with the Canadian Northern Railway for over 300 miles of wire fencing to be erected along their lines in Alberta and Saskatchewan.

Frederick B. Stevens, manufacturer of foundry facings, foundry supplies, buffing compositions and platers' supplies, Detroit, Mich., and Windsor, Ont., has opened up a warehouse at 256 MacDonnell Ave., Toronto. Rupert C. Bruce, located in Toronto, is Canadian sales agent.

The contract for the engine and dynamo for Kamloops power scheme was awarded to the Canadian Westinghouse Co. and for the boiler and condensor to the Canadian Fairbanks Co. Thirteen companies tendered. It is expected that the new plant will be ready in three months.

The Dominion Foundry Supply Co., of Toronto and Montreal have been appointed exclusive Canadian agents for the Brown Specialty-Machinery Co., Chicago, Ill. This latter company manufactures the Hammer Core machine, several instalations of which have been made in Canada.

Messrs. Edmund Wragge, of Toronto, and C. Beresford Fox have entered into partnership as Civil and Consulting Engineers under the name of Wragge & Fox, at 613 Traders Bank Building, Toronto, and are acting as correspondents of Messrs. Sir Douglas Fox & Partners, London, England.

The cargo ferry barge, Sidney No. 2 brought from New Westminster several cars laden with machinery for the two Grand Trunk Pacific sternwheel steamers being built at Victoria. The machinery was built by the Polson Ironworks, Toronto. There were four large cars laden with machinery, and a flat car carrying a big boiler.

The Falls Hollow Staybolt Co., Cuyahoga Falls, Ohio, established agencies in Canada for the sale of its products in the territory west of Lake Superior with the Brydges Engineering & Supply Co., 249 Notre Dame Avenue, Winnipeg, and with Mussens, Ltd., 299 St. James Street, Montreal, for the sale of its staybolt material in the territory east of Lake Superior. The company has appointed H. J. Skelton & Co., Royal London House, Finsbury Square, London, E.C., England, as its representative for the British Isles and India.

Peat for Gas.

A contract has been awarded for the construction of an experimental plant at Ottawa to be used by the Mines Branch, under Dr. Haanel, for the purpose of ascertaining the value of peat in making producer gas. It is held that peat can be made for smelting and other fuel purposes. The station will cost about $13,000. The contract has been given to Doran & Devlin, Ottawa.

Bearing the World's Load.

This is the title given to a book issued by the Chapman Double Ball Bearing Co., Toronto, describing the various applications of the Chapman double ball bearing. The development of the principle of double ball bearings and the uses are well illustrated. Among the machinery where double ball bearings are used to reduce friction are line-shaft and counter-shaft bearings, motors, waggons, machine tools, street cars, shop trucks, mine trucks, automobiles, etc. The story is told in a way that should interest every proprietor superintendent, foreman and master mechanic.

Algoma Steel Co. Enlarge.

The Algoma Steel Co., Sault Ste. Marie, Ont., have placed a contract with Mackintosh, Hemphill & Co., Pittsburgh, for an 18-in. and 12-in. combination structural and merchant mill. The equipment consists of continuous heating furnaces with gas producers, coal and ash handling machinery, an 18-in. and a 12-in. three-high mill (to be driven by electric motors), tables, cooling beds with transfer machinery, straightening machine, saws and shears. There will be electric overhead traveling cranes in the main building, and every provision is to be made for the economical handling of the varied products which it will be necessary to manufacture in order to meet the demands of the Canadian market.

Advertising Welland.

The following from the Welland Telegraph of June 11 shows how the advertising in Canadian machinery is read:

"The Advertising Committee of the Board of Trade began work this week on the finest publication that has yet been issued by the town.

"Wm. Fitzsimmons, Industrial Commissioner of the Grand Trunk Railway, and R. W. Long, District Freight Agent, were in town on Tuesday to call on B. J. McCormick. Both gentlemen expressed themselves as being well pleased with the publicity campaign that had been carried on by Welland and agreed to place the services of their department at the disposal of the Board of Trade. They will be back again shortly to spend a day in town. In the meantime they have directed that the photographer of their department be sent to Welland to take views of industrial interest.

"A Chicago steel manufacturer who was in town a few days ago, spoke very highly of the advertisement carried by the Board of Trade in Canadian Machinery. It was at the big convention in Cincinnati that the two page yellow insert caught his eye."

Cobalt Power Development.

Mining in Cobalt will be simplified to a great extent when the Cobalt Hydraulic Power Co. is able to drive drills, with air pressure from Ragged Chutes, on the Montreal River.

Nine miles of 26 inch pipe will be required to bring this air flow into camp and 12 inch loop line will start at the La Rose bridge, circle the entire town and join the main piping. In addition to the loop there will be branch lines, by way of the Colonial and Nova Scotia and another line will run to Kerr Lake. At Cobalt there will be about 110 lbs. pressure and will be charged for per that pressure.

To the larger consumers the air will be supplied by meter, the terms of which will be 25 cents per thousand cubic feet of compressed air at 100 lbs. pressure, which will be measured by the meter similar to the system used by gas companies in the big cities.

To the small consumers, who will pay for pipe connection from premises to main pipes, the following rates will be charged, per drill per 10-hours shift: 1 drill, $5; 2 drills, $4; 3 drills, $3.50; 4 drills, $3.13; 5 drills, $2.80; thus varying from $5 per shift per drill to $2.80 per shift per drill for five drills or more.

Five million pounds of pipes, bolts and other material will be required to carry out the scheme. A great deal of this material was received from Germany.

The transmission line for the electric power from Fountain Falls will be ready for use shortly. The rates charged will be under 25 h.p. 3c. per kilowatt hour, as figured by Watts meter.

For 25 h.p. and under 50 h.p., 2c.
Over 50 h.p. and under 200 h.p., 1¾c.
Over 100 h.p. and under 200 h.p., 1 5-10c.
Over 200 h.p. and under 300 h.p., 1 4-10.
Over 300 h.p. and under 400 h.p., 1 3-10.
Over 400 h.p. and under 500 h.p., 1 2-10c.

Over 500 h.p. will be 5c. per kilowatt hour and in addition to these rates there will be a charge of $1 per month per horse power on the rated capacity of the installed motors. The bills to be reduced by a discount, having a maximum of 13 per cent. based on the load factor.

Point du Bois Generating Station.

Sealed tenders on prescribed forms addressed to the Chairman of the Board of Control, Winnipeg, Canada will be received at the office of the undersigned up to 11 a.m. on Monday, August 2nd, 1909, and Monday, August 16th, 1909, as below, for the manufacture, delivery and erection of the hydraulic, electric and auxiliary equipment of the Municipal Generating Station on the Winnipeg River.

The specifications and plans will be on exhibit after June 15th at the office of the following:—Engineering, London, Eng., Engineering News, New York City, Smith, Kerry & Chace, Toronto, Wm. Kennedy, Jr., Y.M.C.A. Building, Montreal, and Smith, Kerry & Chace, Winnipeg.

Copies of the instructions to bidders, of the plans, specifications and form of tender, may be obtained from the Power Engineer's office, Carnegie Library Building, Winnipeg, and at the office of "Engineering", London, Eng., after June 15th, but the application for these must be accompanied by deposit, as listed below, for each section applied for. This deposit will be returned to the applicant only upon the return to the Power Engineer's Office of the plans and specifications in good order.

Each tender must be accompanied by a certified cheque payable to the city treasurer for the sum called for in the corresponding instructions to bidders, which cheque will become forfeit to the corporation in the event of the successful tenderer refusing or neglecting to execute a satisfactory contract when called upon so to do.

Tenders will be received upon the following sections:—

*A.—Specifications Nos. 5 and 6 respectively for 5200 h.p. turbines (5), 450 h.p. turbines (2), deposit $250. *This tender returnable August 2nd, 1909.

B.—Specifications Nos. 7, 8 and 11, respectively, for 3000 K.W. Generators (5), 250 K.W. Generators (2), switching and accessory apparatus. Deposit $250.

C—Specification No. 10 for Step up Transformers (6). Deposit $100.

D.—Specification No. 12 for light, heat and power systems. Deposit $50.

E.—Specification No. 23 for protective apparatus. Deposit $50.

F.—Specification No. 25 for electric travelling cranes (3). Deposit $50.

G.—Specification No. 27 for auxiliary apparatus. Deposit $100.

As an alternative, tenderers may include or group together one or more of the above section providing that they have also tendered for the individual sections of such grouping.

An Appropriate Hanger.

The Lincoln-Williams Twist Drill Co., Taunton, Mass., have issued a pretty hanger, which they are mailing to their friends. Above an arm clothed in the army blue, holding a glass, floats the United States flag with the words "July 4th.; A Toast—Gentlemen: 'Our Country.'" The whole idea is cleverly worked out and very appropriate.

Big Shipbuilding Plant.

The Polson Iron Works Co., have applied to the city of Toronto for a lease of fifty acres of land at the east end of the bay, near Keating's cut, and it is their intention to enlarge and improve their plant, which is now situated at the foot of Frederick Street. A general shipbuilding plant will be installed on a large scale, and in connection with it there will be a floating drydock capable of taking in the largest of the lake-going vessels. The drydock is to be built in sections, and when the Welland Canal is deepened, which is shortly to be done, the drydock is to be further enlarged.

Canadian Westinghouse Busy.

The Canadian Westinghouse Co., Hamilton, are preparing to supply their part of the Hydro-Electric power scheme equipment, the contract for which was devided between the Canadian General Electric and the Canadian Westinghouse. The latter company will completely equip the main station at Niagara Falls, the main switching station at Dundas, the sub-stations and protective apparatus. Work on the apparatus is being started at once and will extend over ten months. The Canadian Westinghouse expect to increase their staff at an early date to take care of this contract and others that are on hand.

Manchester Civic Gas Plant.

Municipal ownership of the city gas plant has been proven to be not only a profitable undertaking for Manchester, England, but economical for the consumer as well. The city's profits since the works were taken over 25 years ago, have been $6,750,375, while the price of gas in Manchester district at present is only 55 cents per thousand cubic feet, according to a report to the Bureau of Manufactures, from United States Consul Howe. To illustrate the growth of the business, it is stated that the producing capacity of the works is 26,900,000 cubic feet per 24 hours, against 13,000,000 in 1883. An investment of $13,382,875 capital is represented. Manchester has a population of about 600,000, being about the size of Boston and St. Louis.

Another Big B.C. Power Concern.

At last it appears as if there will be something done with the proposition of the Stave Lake Power Company on Stave river, about thirty miles from Vancouver. For some years past, development of this waterpower has gone on slowly, but it is now announced that work will be active since eastern Canadians are to put up $2,500,000. C. H. Cahan, a leading lawyer of Montreal and Halifax, A. R. Doble and A. M. Aitkens, of Montreal, are spending a couple of days at Stave river, looking over the property. Just what this will ultimately mean to the lower mainland of British Columbia is difficult to prophesy. With other and cheaper power producing methods coming into vogue, by the time this is ready for operation, waterpowers may have taken second place. This, however, is only supposition. Still, the situation in Vancouver and vicinity will be an interesting one with two companies in the field. The B. C. Electric Company now controls lines of railway in Vancouver and New Westminster, and suburban and interurban lines, including the one under construction to Chilliwack. It controls the electric lighting and gas franchise in Vancouver, and the electric lighting in and around both cities. It also supplies power, all of which comes from the large plant at Lake Buntzen, which is to be so improved as to give much more power. With such a hold on the communities, it will be a hard job for another company to get into the game. It has been stated that the Stave Lake Power Company will make a specialty of supplying power for industrial purposes, and in this line there will be considerable room with the number of large and small enterprises that are being establisned. With more companies in the field, the better it should be for the manufacturer, who can stand all the cheap power he can get.

Canadian Machine Tool Markets

THE METAL SITUATION.

Fluctuating movements have characterised the primary markets. Tin has gained and lost ground, and it cannot be said that the speculative movement in London has inspired confidence. Consuming conditions in America are not favorable to a staple market, and it all depends upon the bull operators in London whether tin keeps up. The speculative copper movement in the Old Country is not helping New York quotations, and the weakness apparent in London has caused figures to decline across the border. Consumption is on the dull side, and the larger interests seem to be well provided with metal for the time being. Lead has been on the quiet side with a tendency to weakness. There is plenty of metal on the market. Spelter is still very firm both in London and St. Louis. Consumption is good, and heavy Continental business is reported. Heavy shipments of galvanized sheets from the Old Country to South America and other places have taken place. The iron and steel markets in the Old Country are reported to be somewhat more active. Cleveland warrants are quoted at 48 shillings and threepence. Production in iron and steel in the States continues to increase steadily. A lot of the material is going into stocks, but there is no doubt as to the improving consumption. Prices generally are firm, with an advancing tendency.—F.J.A.

TORONTO.

The demand for machine tools during the past month has not been as brisk as was expected though trade generally is on the increase as evidenced by the trade reports and customs returns. The steady expansion of May led the dealers to believe that the growth would continue. The smallness of the orders placed during the month of June is only a lull before renewed buying. The railroads are proceeding with construction work and orders for machine tools are sure to follow. Some of the car shops and railroad supply shops, especially those in Eastern Canada are very busy filling orders but the increased mileage of tracks being laid this summer will require more rolling stock than is being manufactured at the present time. When the railroads place expected orders there will be increased demand for machine tools.

The demand for power machinery is satisfactory, the volume of business for all lines being quite heavy. There is a growing demand among municipalities for water pumping and lighting plants, which has stimulated the trade in power lines. The large electrical manufacturing companies of Ontario are busy and anticipate a still greater briskness which will necessitate increasing the working staff.

There is a fair volume of orders for light gray iron castings and nearly all the jobbing foundries are very busy. The brass foundries, likewise, report a good demand for brass and bronze castings.

WINNIPEG.

The local supply houses are receiving large orders for the heavy machine tools. In various parts of the West machine repair shop are opening up, and this has stimulated the trade in smaller machine tools. The extensive building being done in the city has greatly benefited the machine trade, and strengthened the smaller tool market. The general improvement in the trade has made the market firmer in all lines. Wood working tools, which advanced a few weeks ago, continue firm, and it is expected that the small steel tool market will gradually develop, and be put on the same basis as that of larger manufacturing centres. A good market, however, may be always depended upon for heavy tool specialties.

Tenders are being called by the secretary of the public works department for the supply and consttuction of balanced self-operating hydraulic sluice valves and connected machinery for the St. Andrew Lock at Lockport, Manitoba. Plans and specifications may be seen in the office of A. R. Dufresne, Winnipeg, and in the government engineer's office at Lockport. Tenders close on June 28.

The contract for supplying and installing the electric lighting fixtures in the Fort Garry depot has just been let to the Robert Mitchell Co., Ltd., of Montreal and Winnipeg, and is believed to be the largest contract of this kind ever secured by a Canadian firm. It covers all chandeliers and lights, exclusive of the wiring, which is covered by a separate contract, and involves a sum in the neighbothood of $30,000.

A number of machine men were in conference at the Royal Alexandra recently. Among the firms represented at the meeting were the Sawyer and Massey Company, the American Abell Company and the George White Sons, Company, Limited, of London, Ontario. It was stated that the questions discussed were matters of quite minor importance in connection with the machine business in the west.

The Manitoba Rolling Mills Co. may remove their plant from this city. A new site at St. Boniface may be selected and the company will proceed at once with the work of transferring the plant, which will be quadrupled in size and capacity.

The improvements planned by the company not only include the extensions to the present plant to four times its capacity, but they also contemplate the addition of a steel mill and possibly a puddling plant. Mr. McElroy is president of one of the largest horseshoe manufacturing concerns in New York State and when the western Canada business warrants such a step a horseshoe plant will also be put in. The present extensions will give accommodation for at least 400 men, a large number of whom are highly paid, for it is designed to run day and night, with double shifts on each, working the two trains of rolls to their full capacity. The work will cost about $250,000. The steel mill and other additions will more than double the number of men required.

The mineral resources of Riding Mountain, Manitoba, are about to be developed by a syndicate which has purchased the mineral rights of many of the settlers. Samples taken at a depth of 300 feet have been reported on favorably by the head office of the syndicate and it is the intention to sink a shaft 1,000 feet when it is confidently expected that oil and coal in paying quantities will be found.—L.C.H.

VANCOUVER.

An industry of direct importance to the iron trade of Vancouver is the establishment of the drydock in the east end on Burrard Inlet, on the property owned by the Ross & Howard Iron Works. Nicol Thompson, who has had this matter in hand for some years, has returned from Ottawa and announces that his interview with the government was successful and that a subsidy is to be granted of three per cent. on the total cost of the dock for twenty years. As the estimated cost of construction will be one and three quarter million dollars, this means something like $37,500 per annum. Mr. Thompson states that construction will proceed as soon as the working out of the necessary details will allow, and that he will visit England shortly to float the scheme. The dock will be one of the first of its kind on the Pacific coast to be a pontoon floating dock of steel, 500 feet long and capable of accommodating vessels of 10,000 tons. The terms of the subsidy necessitates the construction within two years, and the promoters are certain the time limit will not be exceeded. The dock is a necessity with the increase of shipping, for all the ways are full and vessels have to wait their turn.

H. K. Dutcher, civil engineer of this city, has returned from Kamloops, where he spent several days in connection with the power scheme being instituted there, and when the tenders for the supply of the machinery were opened. The contract for the engine and dynamo was awarded to the Canadian Westinghouse Company and for the boiler and condensor to the Canadian Fairbanks Company. Thirteen companies tendered. It is expected that the new plant will be ready in three months.

At the last meeting of the Fire and Police Committee, tenders were opened for 5,500 feet of rubber hose for the fire department. The tenderers were the Canadian the Durham, the Dunlop and the Vancouver Rubber Companies, the prices being very even, running from $1.10 ans $1.05 for the first grade, to 95c. for the second. Five minutes were allowed a representative of each company to address the committee. The chief of the fire department recommended the Eureka at $1.10. The awards were: Vancouver Rubber Company, 3,000 feet Eureka; Dunlop Company, 1,000 feet Dunlop; Canadian Rubber Company, 1,000 feet Keystone; the Durham Rubber Company, 500 feet Magnet. The tender of the Vancouver Rubber Company to supply couplings at $2.44 per set was accepted.

Six carloads of machinery arrived in town this week consigned to the Victoria Machinery Depot, Victoria, B.C., to be installed in the Skena river steamer being built by this ship building firm.

CATALOGUES.

OILDAG—From Acheson Oildag Co., Niagara Falls, N.Y., catalogue and price list of oildag paste for engines.

EXHAUST FANS—From Crocker-Wheeler Co., Ampere, N.Y., bulletin 112 describing their ventilating fans with motor attached. These are for use in offices, churches, factories, etc.

INSTRUCTION SHEET.—From Gisholt Machine Co., Madison, Wis., illustrating and describing the method of finishing street car motor pistons on a Gisholt lathe.

INDUCTION MOTORS—Bulletin No. 102 from the Packard Electric Co., St. Catharines, Ont., describes in detail the Packard Electric induction motor adapted for all classes of industrial drive.

MICROMETERS.—From Elliott Bros., 36 Leicester Sq., London, W.C., England, booklet describing their line of micrometers. This line has a special arrangement of figures around the measuring head so that each division is numbered.

VALVE STEMS.—A neat little booklet from the Electric Welding Products Co., Cleveland, Ohio, illustrating and describing the electrical welded nickel steel alloy valves, and carbon steel stems. It also includes reference to other electrically welded products.

FINISHED STEEL BOLTS AND SCREWS.—Booklet from the Electrical Welding Products Co., Cleveland, describing the making of bolts and screws by electric welding and the welding of brass heads on a steel body for electrical work or ornamental fixtures.

CASE-HARDENING.—A twenty page booklet from W. H. Palfreyman & Co., 17 Goree-Piazzas, Liverpool, gives some valuable hints about case-hardening, what to use and how to do it. The book contains an advertisement for Palfreyman's hydro carbonated bone black for case hardening.

MILLING MACHINES—Catalogue, Edition D, 96 pages printed in English, French and German, containing descriptions of milling machines, cutter and tool grinders, vertical, horizontal and tapping machines, drill lathes, gang drills, etc. The methods of doing work on the tool grinder are fully illustrated and instructions given.

PIPE CUTTING AND THREADING MACHINERY.—A 36 page catalogue from Curtis & Curtis Co., corner Railroad Ave. and Gordon St., Bridgeport Conn., manufacturers of the Forbes' Patent Die Stock. The pipe cutting and threading machinery is described and illustrated and prices are given for the various sizes of hand and power machines.

GRAVITY MOULDER.—Catalogue, M—9, from A. Buck's Sons Co., Elizabethtown, Pa., describes fully the operation of Buch's No. 2 Gravity Moulding Machine. The operation of this machine is fully described and illustrated. Buch's jar and squeeze moulding machine is also described and illustrated. These machines are manufactured in Canada by Ontario Wind Engine & Pump Co., Toronto.

TOOLS AND TOOL HOLDERS.—Catalogue No. 17 from Armstrong Bros., Tool Co., 104-124 N. Francisco Ave., Chicago. Tools are described and illustrated for turning, boring, planing, slotting, threading, etc. Among the new tools are a drill drift, Packer ratchet drills, improved drop forged "C" clamps with long hub for screw, short ratchet drill and quick action drill vise.

GRINDING WHEELS AND MACHINERY—The Norton Co., Worcester, Mass., have just issued a handsome and complete catalogue of alundum grinding wheels, grinding machinery, India oil stones, rubbing and sharpening stones, etc. It contains 167 pages, is printed on coated paper and illustrates various sizes and shapes of wheels for different grinding machines on the market.

MILLING MACHINES.—Catalogue No. 17 from Ingersoll Milling Machine Co., Rockford, Ill., well bound, 102 pages on coated paper. Their lines of milling machines are fully described and illustrated. Illustrations are also given of numerous instalations and of methods for milling different classes of work on the machine. The Ingersoll Grinder is described and details of operations are shown.

A MODEL FOUNDRY.—Booklet from the Whiting Foundry Equipment Co., Harvey, Ill., containing two plans of foundries. An outline is given of the general scheme followed in planning foundries, which of necessity will be modified to meet local conditions of ground space. Illustrations and brief descriptions are given of the latest designs and installations of equipment covering almost the entire line of Whiting products.

FIREBRICK—From Harbison-Walker Refractories Co., Pittsburg, Pa., illustrated catalogue for 1909, 158 pages, coated paper, gilt edges, leather bound. Silica, magnesia, chrome and fire clay brick and various refractories are fully described. The catalogue is well illustrated and the construction of fire brick linings in cupolas, boiler settings and various furnaces is shown. The catalogue will be sent to foundry foremen applying for it.

LATHES.—Catalogue from New Haven Mfg. Co., New Haven, Conn., manufacturers of standard and improved lathes from 18 in. to 65 in. swing, in lengths from 8 ft. to 36 ft.; planers 24 in. to 60 in. square, up to 20 ft. in length and slotters with 10 in. stroke. The catalogue is tastily gotten up, well illustrated and shows the details of construction of their lathes. The catalogue is an excellent treatise on the New Haven machinery.

DRILLS AND SOCKETS—Catalogue of "drills and sockets that are different," from the American Specialty Co., Chicago. The drills and sockets described are radically different from those in common use for the past few years. The Collis line of high speed drills, flat and flat twisted drills are described. This latter drill has been fitted with a Morse taper shank and requires only an ordinary chuck. The "Use-Em-Up" drill sockets are described and prices are given for the different drills.

CRUCIBLES.—Catalogue on coated paper from Jonathan Bartley Crucible Co., Trenton, N. J., showing various types and sizes of graphite crucibles and specials used in foundry use. There are other products described such as graphite phosphorizers, crucible covers, stirrers, skimmers, etc. The second part of the catalogue is devoted to instructions for the proper handling of crucibles. The third part is devoted to graphite and mining in Ceylon. The catalogue is interesting and instructive reading.

BOOK REVIEWS.

THE SLY PATHFINDER.—Published by W. W. Sly Mfg. Co., Cleveland.

This is the first issue of this publication and was distributed among foundrymen previous to the convention. It is full of information in regard to foundry practice and contains some witticisms that at once engage the attention of the reader.

MILLWRIGHTING—By James F. Hobart, 401 pages 6 x 9 inches, 141 illustrations, published by the Hill Publishing Co., 503 Pearl St., New York. Price $3.00 net.

Millwrighting includes the laying out of new buildings or extensions, the putting in of foundations for machinery, the use of the transit for locating definite points, putting up shafting and aligning it, setting up new engines or machinery and other work of a similar nature.

The need of a man in a shop who could attend to the work mentioned has often been keenly felt in many manufacturing establishments. This work covers the work thoroughly and should be included in the library of every superintendent or master mechanic who has work of this nature to oversee. All points are carefully explained, the mixing of concrete for foundations, ways of testing it, framing of buildings, making of molds and batters for concrete foundations, strength of materials needed and used, laying out of shafting, use of belts and the power they should give, handling heavy machinery by tackle and skids, setting of steam boilers, engines, etc.

AUTOMATIC SCREW MACHINES AND THEIR TOOLS.—By C. L. Goodrich and F. A. Stanley. Hill Publishing Company, New York. Cloth, 256 pages, 6x9; 284 illustrations, 27 tables. Price, $2 net.

This book is intended as as a treatise for the use of toolmakers, screw-machine operators, tool designers and others connected with the construction and manipulation of automatic screw machines and turret lathes. It is arranged in two parts: Section 1 illustrating the various types of automatic screw machines and their tool equipments, and section 2 dealing in detail with the construction and use of screw-machine tools. In addition to detailed descriptions of the different types of "automatics" and "semi-automatics," section 1 explains fully the methods of laying out cams for the Pratt & Whitney and Brown & Sharpe machines, the cam adjustments on the Cleveland automatics, etc. The chapters on camming contain, besides diagrams, numerous tables for facilitating the operation of laying out the cams. A chapter on speeds and feeds is included in the book and should be of service when laying out cams and setting up machines, as the tables in this chapter cover speed and feed rates for all kinds of screw-machine tools operating on the ordinary classes of material. Including single-spindle, double and multiple-spindle, magazine and semi-automatic machines, nineteen machines of the following makes are illustrated in eighteen chapters of section 1: Acme, Alfred Herbert, Brown & Sharpe, Cleveland, Gridley, Potter & Johnston, Pratt & Whitney, Prentice, Spencer, Universal. The illustrations show in addition to the machines themselves, turret and cross-slide tools, special attachments, countershaft diagrams, etc.

TAPER GAUGE FOR CROSSHEAD KEYS.

By Nene.

Locomotive crosshead keys are generally supposed to be of a standard taper (1 in. in 16 in. or 1 in. in 20 in.) but owing to subsequent fitting of keys, for repairs, etc., they lose their original

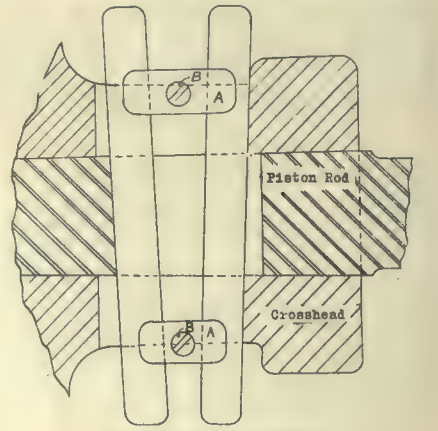


Fig. 1.—Tool in Position.

taper, and ultimately the only way to ascertain the correct taper, is by careful measurement of each head and piston rod after the head has been drawn on fairly tight with the old key.

The purpose of this tool is to accurately measure the taper, and furnish dimensions for shaping down the new key. Fig. 1 shows the tool in position in crosshead and piston rod, it also shows the general construction of the tool, and manner of using it.

The side pieces are held by friction, between the four straps AAAA, the pressure being regulated by the screws BB, and the tool is adjusted by simply tapping it, same as for adjusting common stiff joint calipers.

After tool has been properly adjusted to fit taper as shown in Fig. 1, tool is

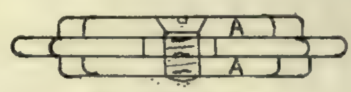


Fig. 2.—End View.

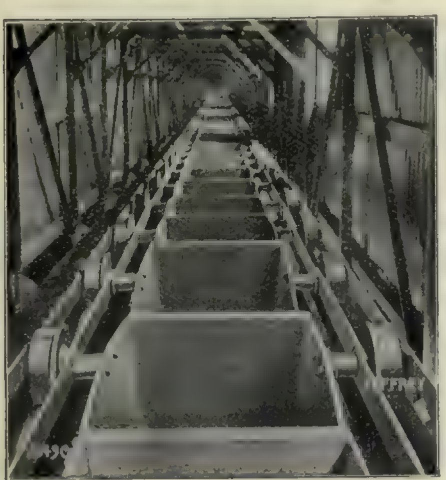
removed and will furnish correct dimensions, as to taper and width, for roughing out new key on shaper or forge, and which should require very little fitting afterwards.

Mechanics accustomed to this line of work will readily appreciate the simplicity and the adaptability of this tool.

Fig. 2 is an end view of this tool, to more clearly show the construction of the tool.

Material for tool is about 5-32 in. thick.

Elevating and Conveying Machinery



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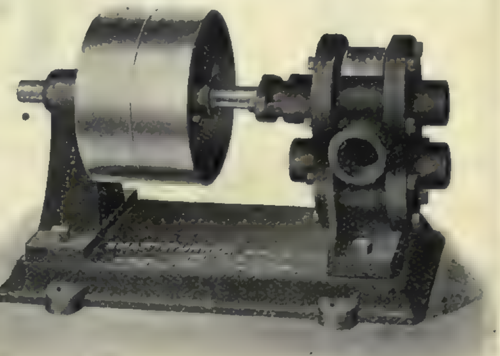

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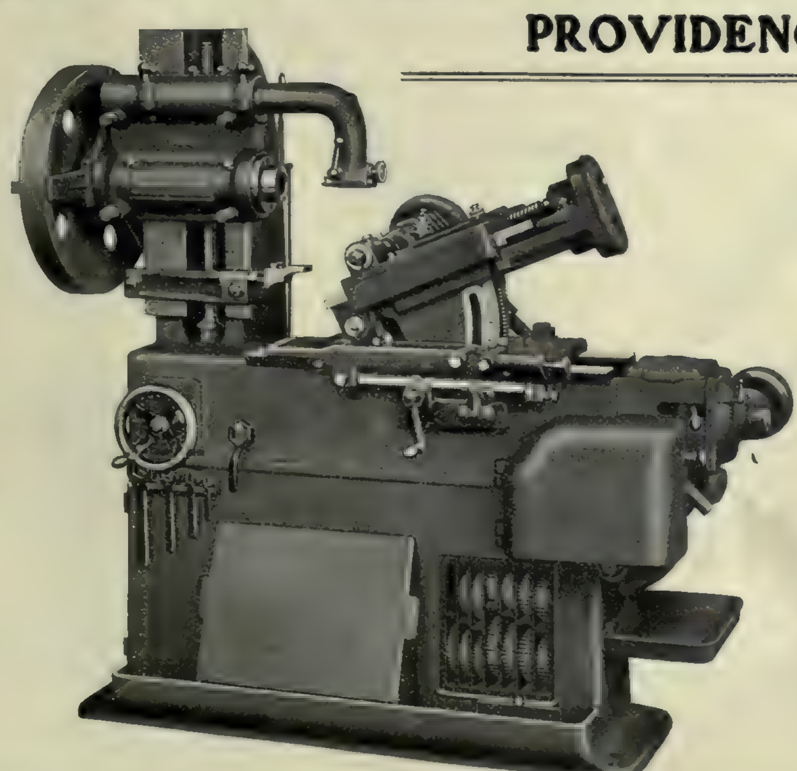

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Spur and bevel gears to 18″ diameter, 4″ face, 4 diametral pitch in cast iron, 5 diametral pitch in steel.

ACCURACY OF FINISHED WORK, ECONOMICAL OPERATION and CONVENIENCE OF CONTROL are pronounced features of this machine.

Careful attention is given to the design and construction of each part in order that the machine may be well adapted to the most severe service.

Changing of work is quickly and easily accomplished, thereby facilitating a large economical production.

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Core Compounds.
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Dominion Foundry Supply Co., Toronto
Hamilton Facing Mill Co., Hamilton.
Millers' Products Co., Chicago, Ill.
H. E. Mills Mfg Co, Syracuse, N.Y.
Stevens, F. B., Detroit, Mich.

Core-Making Machines.
Brown Specialty Machinery Co., Chicago, Ill.
Falls Rivet & Machine Co., Cuyahoga Falls, Ohio.
Hamilton Facing Mill Co., Hamilton.
Stevens, F. B., Detroit, Mich.

Core Ovens.
Calumet Eng. Works, Harvey Ill.
Detroit Foundry Supply Co., Windsor.
Dominion Foundry Supply Co., Montreal
Falls Rivet & Machine Co., Cuyahoga Falls, Ohio.
Hamilton Facing Mill Co., Hamilton and Montreal.
Sheldons Limited, Galt
Stevens, F. B., Detroit, Mich.
Whiting Foundry Equipment Co., Harvey, Ill.

Core Prints——Standard.
Falls Rivet & Machine Co., Cuyahoga Falls, Ohio.
Hamilton Facing Mill Co., Hamilton.

Core Sand Cleaners.
Sly, W. W., Mfg. Co., Cleveland

Core Wash.
H. E. Mills Mfg Co, Syracuse, N.Y.

Counterbores.
Cleveland Twist Drill Co, Cleveland

Countersinks.
Cleveland Twist Drill Co., Cleveland

Couplings.
Dodge Mfg. Co, Toronto
Gardner, Robt. & Son. Montreal
Owen Sound Iron Works Co, Owen Sound

Couplings, Air.
Canadian Rand Co, Montreal.
Independent Pneumatic Tool Co., Chicago

Cranes, Electric and Hand Power.
Advance Machine Works, Walkerville,
Calumet Eng. Works, Harvey, Ill.
Canadian Rand Co., Montreal.
Dominion Foundry Supply Co., Montreal
Gardner, Robt & Son. Montreal
Hamilton Facing Mill Co., Hamilton.
Milroy-Harrison Co., Toronto
Mussens Limited, Montreal.
Niles-Bement-Pond Co., New York.
Northern Engineering Works, Detroit
Owen Sound Iron Works Co, Owen Sound
Smart-Turner-Machine Co., Hamilton.
Whiting Foundry Equipment Co., Harvey, Ill.

Cranes, Hydraulic.
Calumet Eng. Works, Harvey, Ill.
Whiting Foundry Equipment Co., Harvey, Ill.

Crank Pin Turning Machine.
London Mach. Tool Co., Hamilton.
Niles-Bement-Pond Co., New York.

Crossings, Diamond Rail
Montreal Steel Works, Montreal

Crucibles.
Battley, Jonathan, Crucible Co, Trenton, N.J.
Detroit Foundry Supply Co., Windsor
Dominion Foundry Supply Co., Montreal
Hamilton Facing Mill Co., Hamilton.
Seidel, R. B., Inc., Philadelphia
Stevens, F. B., Detroit, Mich.

Crushers, Rock or Ore.
Jeffrey Mfg. Co., Montreal
Waterous Engine Works Co., Brantford.

Cupolas.
Advance Machine Works, Walkerville
Calumet Eng. Works, Harvey Ill.
Detroit Foundry Supply Co., Windsor
Dominion Foundry Supply Co., Montreal
Hamilton Facing Mill Co., Hamilton.
Northern Engineering Works, Detroit
Sheldons Limited, Galt.
Whiting Foundry Equipment Co., Harvey, Ill.

Cupola Blast Gauges.
Dominion Foundry Supply Co., Montreal
Hamilton Facing Mill Co., Hamilton.
Sheldons Limited, Galt

Cupola Blocks.
Detroit Foundry Supply Co., Detroit.
Dominion Foundry Supply Co., Toronto
Hamilton Facing Mill Co., Hamilton
Northern Engineering Works, Detroit
Ontario Lime Association, Toronto

Cupola Blowers.
Detroit Foundry Supply Co., Windsor
Dominion Foundry Supply Co, Toronto
Hamilton Facing Mill Co., Hamilton.
Northern Engineering Works, Detroit
Sheldon's Limited, Galt

Cupola Linings.
Hamilton Facing Mill Co, Hamilton.
Stevens, F. B., Detroit, Mich.

Cupalo Twyers.
Knoeppel Co., Buffalo, N.Y.

Cutters, Flue.
Independent Pneumatic Tool Co., Chicago, Ill.

Cutters, Gear.
Aikenhead Hardware, Ltd, Toronto
Milroy Co., Toronto

Cutters, Pipe.
Aikenhead Hardware, Ltd., Toronto
Hollands Mfg. Co., Erie, Pa.
A. B. Jardine & Co, Hespeler, Ont.
Trimont Mfg Co., Roxbury, Mass.

Cutter Grinder Attachment
Cincinnati Milling Machine Co., Cincinnati

Cutter Grinders.
Cincinnati Milling Machine Co., Cincinnati

Cutters, Milling.
Abbott, Wm, Montreal
Becker Milling Machine Co., Hyde Park Mass.
Cleveland Twist Drill Co., Cleveland
Hamilton Tool Co., Hamilton, Ont.
Milroy Co., Toronto
Mussens Limited, Montreal.
Pratt & Whitney Co., Hartford, Conn.
Standard Tool Co., Cleveland.

Cutting-off Machines.
Armstrong Bros., Tool Co., Chicago
John Bertram & Sons Co., Dundas, Ont.
London Mach. Tool Co., Hamilton.
Mussens Limited, Montreal.
H. W. Petrie, Toronto.
Pratt & Whitney Co., Hartford, Conn.

Cutting-off Tools.
Armstrong Bros. Tool Co., Chicago.
London Mach. Tool Co., Hamilton.
H. W. Petrie, Toronto.
Pratt & Whitney, Hartford, Conn.
L. S. Starrett Co., Athol, Mass.

Damper Regulators.
Darling Bros., Ltd., Montreal

Dies.
Aikenhead Hardware, Ltd., Toronto
Armstrong Bros., Toronto
Banfield, W. H. & Son, Toronto
Bliss, E. W., Co., Brooklyn, N.Y.
Fisher, A. D., Co., Toronto
Gardner, Robt. & Son, Montreal
Hollands Mfg. Co, Erie, Pa.
Scott, Ernest, Montreal.

Die Stocks.
Aikenhead Hardware, Ltd., Toronto
Curtis & Curtis Co., Bridgeport, Conn.
Jardine, A. B., & Co, Hespeler, Ont.
Milroy Co., Toronto

Dies, Opening.
W. H. Banfield & Sons, Toronto
Jardine, A. B., & Co., Hespeler, Ont.
Pratt & Whitney Co., Hartford Conn.

Dies, Threading.
Aikenhead Hardware, Ltd., Toronto
Jardine, A. B., & Co., Hespeler, Ont.
Milroy Co., Toronto

Draft, Mechanical.
W. H. Banfield & Sons, Toronto.
Butterfield & Co, Rock Island, Que.
A. B. Jardine & Co., Hespeler
Pratt & Whitney Co., Hartford, Conn.
Sheldon's Limited, Galt.

Drilling Machines, Horizontal.
John Bertram & Sons Co., Dundas, Ont
Kellogg & Co., Toronto
London Mach. Tool Co., Hamilton.
J. J. McCabe, New York City, N.Y.
Mussens Limited Montreal
Niles-Bement-Pond Co., New York.

Drilling Machines, Locomotive.
American Tool Works Co., Cincinnati.
John Bertram & Sons Co., Dundas, Ont.
Kellogg & Co, Toronto
The Canadian Fairbanks Co., Montreal.
A. B. Jardine & Co., Hespeler, Ont.
London Mach. Tool Co., Hamilton, Ont.
Mussens Limited, Montreal.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.

Drilling Machines, Multiple Spindle.
American Tool Works Co., Cincinnati.
John Bertram & Sons Co., Dundas, Ont.
Kellogg & Co, Toronto
London Mach. Tool Co., Hamilton, Ont.
Mussens Limited, Montreal,
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.

Drilling Machines, Radial.
American Tool Works Co, Cincinnati.
The Canadian Fairbanks Co., Montreal.
Kellogg & Co., Toronto
London Mach. Tool Co., Hamilton.
MacGregor, Gourlay Co., Galt
Mussens Limited, Montreal.
Niles-Bement-Pond Co., New York.

Drilling Machines, Turret.
John Bertram & Sons Co. Dundas, Ont
London Mach. Tool Co., Hamilton.
Niles-Bement-Pond Co., New York.

Drilling Machines, Upright.
American Tool Works Co., Cincinnati.
Bawden Machine & Tool Co., Toronto.
John Bertram & Sons Co., Dundas, Ont.
Fox Machine Co, Grand Rapids.
Hamilton Tool Co., Hamilton, Ont.
A. B. Jardine & Co., Hespeler, Ont.
Kellogg & Co., Toronto
London Mach. Tool Co., Hamilton.
MacGregor, Gourlay Co., Galt
J. J. McCabe, New York City N.Y.
Mussens Limited, Montreal.

Drills, Bench.
Fisher, A. D., Co., Toronto
Hamilton Tool Co, Hamilton, Ont.
Kellogg & Co., Toronto
London Mach. Tool Co., Hamilton.
Pratt & Whitney Co., Hartford, Conn.

Drills, Bit Stock.
Cleveland Twist Drill Co., Cleveland

Drills, Blacksmith.
Aikenhead Hardware, Ltd., Toronto
American Specialty Co., Chicago
Cleveland Twist Drill Co., Cleveland
A. B. Jardine & Co., Hespeler, Ont.
Kellogg & Co., Toronto
London Mach. Tool Co., Hamilton.
Jas. Smart Mfg. Co., Brockville, Ont.
Standard Tool Co., Cleveland.

Drills, Centre.
Aikenhead Hardware, Ltd. Toronto
Cleveland Twist Drill Co., Cleveland
Milroy Co., Toronto
Pratt & Whitney Co., Hartford, Conn.
Standard Tool Co., Cleveland, O.
L. S. Starrett Co., Athol, Mass.

Drills, Coal and Plaster.
Cumming, J. W., New Glasgow, N.S.

Drills, Electric.
Cincinnati Electrical Tool Co., Cincinnati
Fisher A. D., Co., Toronto
Mussens Limited, Montreal.
Niles-Bement-Pond Co., New York.

Drills, High Speed.
Aikenhead Hardware, Ltd, Toronto
American Specialty Co, Chicago
Abbott, Wm., Montreal
Hermann Boker & Co., Montreal
Cleveland Twist Drill Co, Cleveland
Alexander Gibb, Montreal.
J. J. McCabe, New York City, N.Y.
Milroy Co., Toronto
Mussens Limited, Montreal.
Pratt & Whitney Co., Hartford, Conn.
Standard Tool Co., Cleveland, O.

Drills, Hand.
A. B. Jardine & Co., Hespeler, Ont.

Drills, Oil Tube.
Cleveland Twist Drill Co., Cleveland

Drills, Pneumatic.
Allen, John F., New York
Canadian Rand Co., Montreal
Independent Pneumatic Tool Co., Chicago, New York
Mussens Limited, Montreal.
Niles-Bement-Pond Co., New York.

Drills, Portable Electric.
Cincinnati Electrical Tool Co., Cincinnati

Drills, Ratchet.
Aikenhead Hardware, Ltd, Toronto
Armstrong Bros. Tool Co, Chicago.
Cleveland Twist Drill Co., Cleveland
A. B. Jardine & Co., Hespeler,
Milroy Co., Toronto
Pratt & Whitney Co., Hartford, Conn.
Standard Tool Co., Cleveland.

Drills, Rock.
Canadian Rand Drill Co., Montreal.
Jeffrey Mfg Co., Montreal

Drills, Sensitive.
American Tool Works Co., Cincinnati.
Fisher, A. D., Co., Toronto
Fox Machine Co., Grand Rapids.
Kellogg & Co, Toronto
McKenzie, D., Guelph, Ont.
Mussens Limited, Montreal.
Niles-Bement-Pond Co., New York

Drills, Track.
American Specialty Co, Chicago
Cleveland Twist Drill Co, Cleveland

Drills, Twist.
Aikenhead Hardware, Ltd, Toronto
American Specialty Co., Chicago
Abbott, Wm., Montreal.
Hermann Boker & Co., Montreal
Cleveland Twist Drill Co., Cleveland
Alex. Gibb, Montreal.
Milroy Co., Toronto

THREE CLEVELAND TOOLS POINTING TOWARDS ECONOMY

Paradox Adjustable Reamers

The Life of a Paradox Reamer is Nine Times that of an ordinary reamer. (A fact proven by actual statistics covering a long period of trial.)

Compare its price with that of your nine solid reamers and there can be no doubt of

ECONOMY No. 1

Perfect Double-Tang Sockets

A simple, strong and absolutely effective cure for tang trouble in taper shank driving. Uses up your broken tang drills. Doubles the life of your new drills.

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Peerless High-Speed Reamers

Peerless Reamers can be run two or three times as fast as carbon steel reamers.

They are tougher and outlive a Solid High-Speed Reamer.

Figure up the labor and time saved on any big job, and you have

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Be sure you get the "P" it means Economy

The Cleveland Twist Drill Co.

CLEVELAND, OHIO, U.S.A.

Morse Twist Drill and Machine Co., New Bedford, Mass.
Mussens Limited, Montreal.
Pratt & Whitney Co., Hartford, Conn.
Standard Tool Co., Cleveland.

Drill Sockets.
Aikenhead Hardware Ltd., Toronto
American Specialty Co., Chicago
Elevator Specialty Co., Toronto

Dry Kiln Cars.
Sheldons Limited, Galt

Dry Kiln Equipment.
Sheldons Limited, Galt

Dump Cars.
Dominion Foundry Supply Co., Montreal
Hamilton Facing Mill Co., Hamilton.
Jeffrey Mfg. Co., Montreal
Niles-Bement-Pond Co., New York.
Owen Sound Iron Works Co., Owen Sound
Waterous Engine Co., Brantford.

Dust Arresters.
Sly, W. W., Mfg. Co., Cleveland

Dynamos.
Canadian Westinghouse Co., Hamilton.
Hall Engineering Works, Montreal, Que.
Packard Electric Co., St. Catharines.
T. & H. Electric Co., Hamilton.

Electrical Pyrometers.
Thwing, C. B., Philadelphia

Electrical Supplies.
Canadian Westinghouse Co., Hamilton.
London Mach. Tool Co., Hamilton, Ont.
Packard Electric Co., St. Catharines.
T. & H. Electric Co., Hamilton.

Elevators.
Advance Machine Works, Walkerville,
Jeffrey Mfg. Co., Montreal
Waterous Engine Works Co., Brantford.
Whiting Foundry Equipment Co., Harvey, Ill

Elevator Buckets.
Jeffrey Mfg. Co., Montreal
Waterous Engine Works Co., Brantford.

Emery and Emery Wheels.
Aikenhead Hardware Ltd., Toronto
Canadian Hart Wheels Ltd., Hamilton.
Dominion Foundry Supply Co., Montreal
Hamilton Facing Mill Co., Hamilton.
Milroy Co., Toronto
Stevens, F. B., Detroit, Mich.

Emery Stands.
McKenzie, D., Guelph, Ont.

Emery Wheel Dressers.
Aikenhead Hardware Ltd., Toronto
Canadian Hart Wheels Ltd., Hamilton.
Dominion Foundry Supply Co., Montreal
Gardner, Robt. & Son, Montreal
Hamilton Facing Mill Co., Hamilton.
Milroy Co., Toronto
H. W. Petrie, Toronto.
Standard Tool Co., Cleveland.

Engineers' Supplies.
Hall Engineering Works, Montreal.

Engines, Gas and Gasolene.
The Canadian Fairbanks Co., Montreal.
Goldie & McCulloch Co., Galt, Ont.
Jones & Glassco, Montreal
Kellogg & Co., Toronto
Milroy Co., Toronto
Oliver, W. H., & Co., Toronto
The Smart-Turner Mach. Co., Hamilton

Engines, Oil.
Jones & Glassco, Montreal

Engines, Steam.
The Goldie & McCulloch Co., Galt, Ont.
Sheldons Limited, Galt.
The Smart-Turner Mach. Co., Hamilton.
Waterous Engine Works Co., Brantford.

Escutcheon Pins.
Parmenter & Bulloch Co., Gananoque

Excavating Machinery.
Jeffrey Mfg. Co., Montreal

Exhaust Heads.
Darling Bros., Ltd., Montreal.
Sheldons Limited, Galt, Ont.
Standard Engineering Co., Toronto.

Fans, Electric.
Canadian Westinghouse Co., Hamilton.
Fisher, A. D., Co., Toronto
Sheldons Limited, Galt, Ont.
The Smart-Turner Mach. Co., Hamilton.

Fans, Exhaust.
Detroit Foundry Supply Co., Windsor.
Dominion Foundry Supply Co., Toronto
Hamilton Facing Mill Co., Hamilton.
Sheldons Limited, Galt.

Feed Water Heaters.
Darling Bros., Montreal
The Smart-Turner Mach. Co., Hamilton
Waterous Engine Works Co., Brantford.

Fillers (Metallic.)
Smooth-On Mfg. Co., Jersey City, N.J.
Stevens, F. B., Detroit, Mich.

Fillets, Leather & Wooden
Hamilton Facing Mill Co., Hamilton.

Fire Brick and Clay.
Detroit Foundry Supply Co., Windsor.
Dominion Foundry Supply Co., Toronto
Hamilton Facing Mill Co., Hamilton
W. F. Marshall, 97 King W. Toronto
Ontario Lime Association, Toronto
Stevens, F. B., Detroit, Mich.
United Fire Brick Co., Uniontown, Pa.

Forges.
Aikenhead Hardware, Ltd., Toronto
Hamilton Facing Mill Co., Hamilton.
Independent Pneumatic Tool Co., Chicago, Ill.
Monarch Eng. Mfg. Co., Baltimore, Md.
Sheldons Limited, Galt, Ont.

Forges, Oil Rivet.
Monarch Eng & Mfg. Co., Baltimore, Md

Forgings, Drop.
Bliss, E. W., Co., Brooklyn, N.Y.

Forgings, Light & Heavy.
Hamilton Steel & Iron Co., Hamilton

Forging Machinery.
John Bertram & Sons Co., Dundas, Ont.
Kellogg & Co., Toronto
Bliss, E. W., Co., Brooklyn, N.Y.
London Mach. Tool Co., Hamilton, Ont
National Machinery Co., Tiffin, Ohio
Niles-Bement-Pond Co., New York.
Standard Engineering Co., Toronto

Foundry Coke.
Baird & West, Detroit
Stevens, F. B., Detroit, Mich.

Foundry Equipment.
Calumet Eng. Works, Harvey, Ill.
Detroit Foundry Supply Co., Windsor.
Dominion Foundry Supply Co., Toronto
Hamilton Facing Mill Co., Hamilton
Northern Engineering Works, Detroit
Stevens, F. B., Detroit, Mich.
Whiting Foundry Equipment Co., Harvey, Ill.

Foundry Parting.
Dominion Foundry Supply Co., Toronto
H. E. Mills Mfg Co., Syracuse, N.Y.

Foundry Facings.
Detroit Foundry Supply Co., Windsor.
Dominion Foundry Supply Co., Toronto
Hamilton Facing Mill Co., Hamilton.
H. E. Mills Mfg Co., Syracuse, N Y.
Stevens, F. B., Detroit, Mich.

Friction Clutches.
Dodge, Mfg. Co., Toronto
Ideal Clutch Mfg. Co., Toronto

Friction Clutch Pulleys, etc
The Goldie & McCulloch Co., Galt.
Waterous Engine Works Co., Brantford.

Frogs
Montreal Steel Works, Montreal

Furnace Lining.
Monarch Eng. & Mfg. Co., Baltimore, Md

Furnaces.
Detroit Foundry Supply Co., Windsor.
Dominion Foundry Supply Co., Montreal
Alfred Fisher, Chicago, Ill.
Hamilton Facing Mill Co., Hamilton.
Monarch Eng. & Mfg. Co., Baltimore
Northern Engineering Works, Detroit
Stevens, F. B., Detroit, Mich.
Whiting Foundry Equipment Co., Harvey, Ill.

Furnaces, Brass.
Monarch Eng. & Mfg. Co., Baltimore, Md
Whiting Foundry Equipment Co., Harvey, Ill.

Furnaces, Steel Heating.
Monarch Eng. & Mfg. Co., Baltimore, Md
Standard Engineering Co., Toronto
Whiting Foundry Equipment Co., Harvey, Ill.

Gang Planer Tools.
Aikenhead Hardware, Ltd., Toronto
Armstrong Bros. Tool Co., Chicago

Gas Blowers and Exhausters.
Sheldons Limited, Galt.

Gas Producer Plants.
Bain & Mitchell, Montreal
Jones & Glassco, Montreal
Oliver, W. H., & Co., Toronto.

Gauges, Standard.
Aikenhead Hardware, Ltd., Toronto
Cleveland Twist Drill Co., Cleveland
Pratt & Whitney Co., Hartford, Conn

Gear-Cutting Machinery.
Armstrong Bros., Toronto
Becker Milling Mach. Co., Hyde Park, Mass.
Kellogg & Co., Toronto
London Mach. Tool Co., Hamilton.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Hartford, Conn.

Gears, Angle.
Boston GearWorks, Norfolk Downs, Mass.
Gardner, Robt., & Son, Montreal
Goldie & McCulloch Co., Galt, Ont.
Waterous Engine Co., Brantford.
Wilson, J. C., & Co., Glenora, Ont.

Gears, Cut.
Boston Gear Works, Norfolk Downs, Mass
Gardner, Robt., & Son, Montreal
Goldie & McCulloch Co., Galt, Ont.
Horsburgh & Scott Co., Cleveland
MacGregor, Gourlay Co., Galt
New Process Raw-Hide Co., Syracuse, N.Y.

Gears, Mortise.
Boston Gear Works, Norfolk Downs, Mass.
Gardner, Robt., & Son, Montreal
Goldie & McCulloch Co., Galt, Ont.
New Process Raw-Hide Co., Syracuse, N.Y.
Waterous Engine Works Co., Brantford

Gears, Rawhide.
Gardner, Robt., & Son, Montreal
Goldie & McCulloch Co., Galt, Ont.
Horsburgh & Scott Co., Cleveland
New Process Raw-Hide Co., Syracuse, N.Y.
Waterous Engine Works Co., Brantford.

Gears, Worm.
Gardner Robt., & Son, Montreal
Horsburgh & Scott Co., Cleveland

Generators, Electric.
Canadian Westinghouse Co., Hamilton
Hall Engineering Works, Montreal.
Toronto & Hamilton Electric Co. Hamilton.

Grates, Shaking and Dumping
Standard Engineering Co., Toronto

Graphite.
Aikenhead Hardware, Ltd., Toronto
Detroit Foundry Supply Co., Windsor.
Dominion Foundry Supply Co., Toronto
Hamilton Facing Mill Co., Hamilton.
Stevens, F. B., Detroit, Mich.

Grease Cups.
Peterboro Lubricator Mfg. Co., Peterboro, Ont.

Grinders, Automatic Knife.
Canadian Hart Wheels Ltd., Hamilton.
W. H. Banfield & Son, Toronto.
Waterous Engine Works Co., Brantford.

Grinders, Bench.
Canadian Hart Wheels Ltd. Hamilton.
McKenzie, D., Guelph, Ont.
Hall, J. H., & Sons, Brantford.
Kellogg & Co., Toronto

Grinders, Centre.
Canadian Hart Wheels Ltd., Hamilton.
J. J. McCabe New York City, N.Y.
Niles-Bement-Pond Co., New York.

Grinders, Cutter.
Becker Milling Mach. Co., Hyde Park Mass.
J. J. McCabe, New York City, N.Y.
Pratt & Whitney Co., Hartford, Conn.

Grinders, Disc.
Armstrong Bros. Co., Chicago

Grinders, Tool.
Armstrong Bros. Tool Co., Chicago
Blount, J. G., & Co., Everett, Mass.
J. J. McCabe, New York City, N.Y.

Grinders, Pedestal.
Canadian Hart Wheels Ltd., Hamilton.

Grinders, Tool Post
Cincinnati Electrical Tool Co., Cincinnati

Grinding Holders.
Armstrong Bros. Tool Co., Chicago

Grinding Machines.
Canadian Hart Wheels Ltd., Hamilton
Fisher, A. D., Co., Toronto
The Canadian Fairbanks, Montreal.
Gardner Robt., & Son, Montreal
Independent Pneumatic Tool Co., Chicago, Ill.
Kellogg & Co., Toronto
Milroy Co., Toronto
Niles-Bement-Pond Co., New York.

Grinding Machines, Portable, Pneumatic
Independent Pneumatic Tool Co., Chicago.

Grinding and Polishing Machines.
Fisher, A. D., Co., Toronto
Gardner, Robt., & Son, Montreal

Grinding Wheels.
Canadian Hart Wheels Ltd., Hamilton
Carborundum Co., Niagara Falls
Mussens Limited, Montreal.
Milroy Co., Toronto

Hack Saws.
Aikenhead Hardware, Ltd., Toronto
Hermann Boker & Co., Montreal
Kellogg & Co., Toronto
The Canadian Fairbanks Co., Montreal
MacGregor, Gourlay Co., Galt
Milroy Co., Toronto
McKenzie, D., Guelph, Ont.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.
Simonds Canada Saw Co., Montreal

Hack Saw Frames.
Aikenhead Hardware, Ltd., Toronto
Mussens Limited, Montreal.

Hammers, Belt Driven.
MacGregor, Gourlay Co., Galt

Hammers, Drop.
Bliss, E. W., Co., Brooklyn, N.Y.
London Mach. Tool Co., Hamilton, Ont.
MacGregor, Gourlay Co., Galt
Niles-Bement-Pond Co., New York.

Hammers, Machinists.
Jas. Smart Mfg. Co., Brockville, Ont.

Hammers, Pneumatic
Independent Pneumatic Tool Co., Chicago.

Hammers, Steam.
John Bertram & Sons Co. Dundas, Ont.
Kellogg & Co., Toronto
London Mach. Tool Co., Hamilton, Ont.
Mussens Limited Montreal.
Niles-Bement-Pond Co., New York.

Hand Hoists & Trolleys.
Beath, W. D., & Son, Toronto
Whiting Foundry Equipment Co., Harvey, Ill.

Hangers.
Dodge Mfg. Co., Toronto
Fay, J. A., & Egan Co., Cincinnati
Gardner, Robt., & Son, Montreal
The Goldie & McCulloch Co., Galt.
Owen Sound Iron Works Co., Owen Sound
The Smart-Turner Mach. Co., Hamilton.
Waterous Engine Co., Brantford.

Heating Apparatus.
Darling Bros., Ltd., Montreal
Sheldons Limited, Galt.

Hoisting and Conveying Machinery.
Goldie & McCulloch Co., Galt, Ont.
Jeffrey Mfg. Co., Montreal
Niles-Bement-Pond Co., New York.
Northern Engineering Works, Detroit
The Smart-Turner Mach. Co., Hamilton.
Waterous Engine Co., Brantford.
Whiting Foundry Equipment Co., Harvey, Ill.

Hoists, Electric.
Beath W. D., & Son, Toronto
Calumet Eng. Works, Harvey, Ill.
Northern Engineering Works, Detroit
Whiting Foundry Equipment Co., Harvey, Ill.

Hoists, Pneumatic.

Calumet Eng. Works, Harvey, Ill.
Canadian Rand Co., Montreal.
Dominion Foundry Supply Co., Montreal
Hamilton Facing Mill Co., Hamilton.
Independent Pneumatic Tool Co., Chicago.
Mussens Limited, Montreal.
Northern Engineering Works, Detroit
Whiting Foundry Equipment Co. Harvey, Ill.

Hose, Air.

Canadian Rand Co., Montreal.
Canadian Westinghouse Co., Hamilton.
Independent Pneumatic Tool Co., Chicago

Hose, Steam.

Canadian Rand Co., Montreal.
Canadian Westinghouse Co., Hamilton.
Independent Pneumatic Tool Co., Chicago, Ill.

Hydraulic Accumulators.

Niles-Bement-Pond Co., New York.
The Smart-Turner Mach. Co., Hamilton.

Indicators, Speed.

Aikenhead Hardware, Ltd., Toronto
L. S. Starrett Co., Athol, Mass.

Interlocking Plants and Signals

Montreal Steel Works, Montreal

Intersections, Railway

Montreal Steel Works, Montreal

Iron Cements.

Milroy Co., Toronto

Iron Filler.

Detroit Foundry Supply Co., Windsor.
Dominion Foundry Supply Co., Toronto
Hamilton Facing Mill Co., Hamilton and Montreal.
Smooth-On Mfg. Co., Jersey City, N.J.
Stevens, F. B., Detroit, Mich.

Jacks.

Aikenhead Hardware, Ltd., Toronto
Montreal Steel Works, Montreal
Norton, A. O., Coaticook, Que.

Jacks, Pit and Track

Montreal Steel Works, Montreal

Jaws, Face Plate.

Cushman Chuck Co., Hartford, Conn
Skinner Chuck Co, New Britain, Conn

Jigs.

Scott, Ernest, Montreal.

Ladles, Foundry.

Calumet Eng. Works, Harvey, Ill.
Dominion Foundry Supply Co., Montreal
Hamilton Facing Mill Co., Hamilton.
Monarch Eng. Mfg. Co., Baltimore Md.
Northern Engineering Works, Detroit
Stevens, F. B., Detroit, Mich.
Whiting Foundry Equipment Co., Harvey, Ill.

Lamps, Arc and Incandescent.

Canadian Westinghouse Co., Hamilton.
The Packard Electric Co., St. Catharines.

Lathe Dogs.

Armstrong Bros. Tool Co., Chicago.
Pratt & Whitney Co., Hartford, Conn.

Lathes Bench.

Blount, J. G., & Co., Everett, Mass.
Kellogg & Co., Toronto
London Mach. Tool Co., London, Ont.
Pratt & Whitney Co., Hartford, Conn.

Lathes, Double-Spindle.

J. J. McCabe, New York City, N.Y.

Lathes, Engine.

American Tool Work Co., Cincinnati.
John Bertram & Sons Co., Dundas, Ont.
Gardner, Robt., & Son, Montreal
The Canadian Fairbanks Co., Montreal.
Kellogg & Co., Toronto
London Mach. Tool Co., Hamilton, Ont.
MacGregor, Gourlay Co., Gal
J. J. McCabe, New York City, N.Y.
Mussens Limited, Montreal
New Haven Mfg Co., New Haven, Conn
Niles-Bement-Pond Co., New York.

Lathes, Screw Cutting.

John Bertram & Sons Co., Dundas, Ont.
Kellogg & Co., Toronto.

London Mach. Tool Co., Hamilton, Ont.
MacGregor, Gourlay Co., Galt
J. J. McCabe, New York City, N.Y.
Mussens Limited Montreal.
Niles-Bement-Pond Co., New York.

Lathes, Speed.

Blount, J. G., & Co, Everett, Mass.
Kellogg & Co., Toronto
Mussens Limited, Montreal.

Lathes, Spinning.

Bliss, E. W., Co., Brooklyn, N.Y.
MacGregor, Gourlay Co., Galt

Lathes, Turret.

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John Bertram & Sons Co., Dundas, Ont.
Blount, J. G. & Co., Everett Mass.
London Mach. Tool Co., Hamilton, Ont.
J. J. McCabe, New York City, N.Y.
MacGregor, Gourlay Co, Galt
Mussens Limited, Montreal.
Niles-Bement-Pond Co., New York.
The Pratt & Whitney Co., Hartford, Conn
Warner & Swasey Co., Cleveland, O.

Link Belting.

Jeffrey Mfg Co., Montreal
Waterous Engine Works Co., Brantford.

Locomotives, Air.

Canadian Rand Co., Montreal.

Locomotives, Electrical.

Canadian Westinghouse Co., Hamilton
Jeffrey Mfg. Co., Montreal

Locomotives, Industrial.

Jeffrey Mfg Co., Montreal

Locomotives, Steam.

Canadian Rand Co., Montreal.

Lubricating Plumbago.

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Dominion Foundry Supply Co., Montreal
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Machine Divided Rules.

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Lufkin Rule Co., Saginaw, Mich.

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Milroy Co., Toronto
Mussens Limited, Montreal.
The Smart-Turner Mach. Co., Hamilton.

Machinists' Scales.

Lufkin Rule Co., Saginaw, Mich.

Machinists' Small Tools.

Aikenhead Hardware, Ltd. Toronto
Milroy-Harrison Co., Toronto.

Malleable Iron Castings.

Galt Malleable Iron Co., Galt
Jeffrey Mfg. Co., Montreal

Malleable Iron Furnaces.

Monarch Eng. Mfg. Co., Baltimore, Md.

Mandrels.

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Standard Tool Co., Cleveland.

Maple Cogs.

Waterous Engine Works Co., Brantford.

Melting Ladles, Plumbers.

Hollands Mfg. Co, Erie, Pa.

Melting Pots.

Hollands Mfg. Co., Erie, Pa.
Monarch Eng. & Mfg. Co., Baltimore, Md

Meters, Electrical.

Canadian Westinghouse Co., Hamilto

Mill Machinery.

The Goldie & McCulloch Co., Galt, Ont.
Waterous Engine Co., Brantford.

Milling Attachments.

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Becker Milling Machine Co., Hyde Park, Mass.
John Bertram & Sons Co., Dundas, Ont.
Cincinnati Milling Machine Co., Cincinnati.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Niles-Bement-Pond Co., New York,
Pratt & Whitney, Hartford, Conn.

Milling Machines, Bench.

Kellogg & Co., Toronto

Milling Machines, Horizontal

Becker Milling Machinery Co., Hyde Park, Mass.
Brown & Sharpe Mfg Co., Providence, R.I
John Bertram & Sons Co., Dundas, Ont
Kellogg & Co., Toronto
Fox Machine Co., Grand Rapids.
Kempsmith Mfg. Co., Milwaukee, Wis.
London Mach. Tool Co., Hamilton, Ont.
Mussens Limited, Montreal.
Niles-Bement-Pond Co., New York.
Pratt & Whitney, Hartford, Conn.

Milling Machines, Plain.

Becker Milling Machine Co., Hyde Park, Mass.
Brown & Sharpe Mfg Co., Providence, R.I
John Bertram & Sons Co., Dundas, Ont.
The Canadian Fairbanks Co., Montreal.
Cincinnati Milling Machine Co., Cincinnati
Cox Machine Co., Grand Rapids.
Kearney & Trecker Co., Milwaukee, Wis.
Kellogg & Co., Toronto
Kempsmith Mfg. Co., Milwaukee, Wis.
London Mach. Tool Co., Hamilton, Ont.
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MacGregor, Gourlay Co., Galt
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Kempsmith Mfg. Co., Milwaukee, Wis.
London Mach. Tool Co., Hamilton, Ont
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MacGregor, Gourlay Co., Galt
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Mussens Limited, Montreal.
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Milling Tools.

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Brown & Sharpe Mfg Co., Providence, R.I
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Pratt & Whitney Co., Hartford, Conn.

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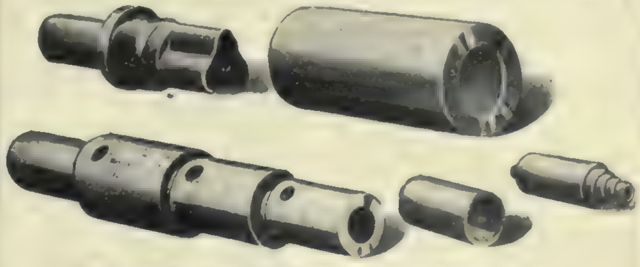

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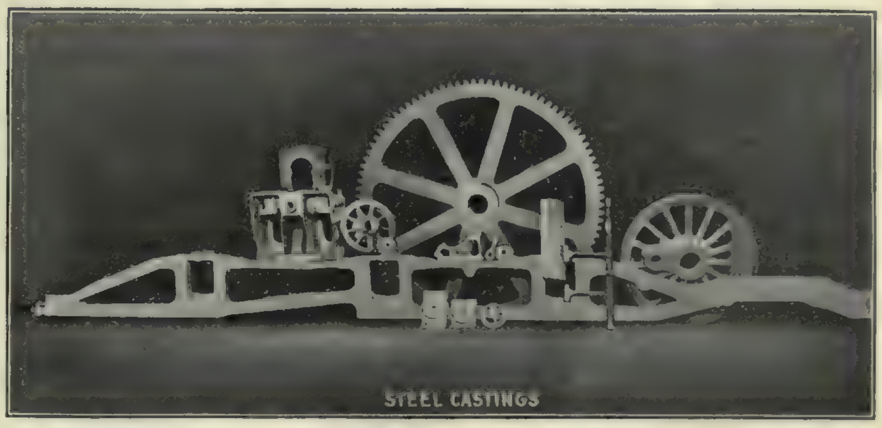

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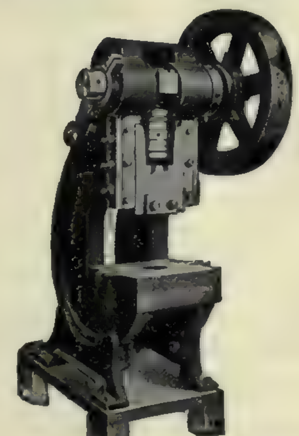

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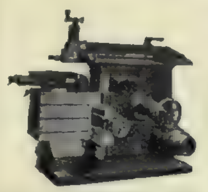

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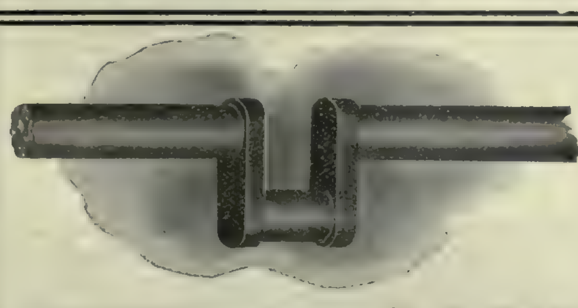

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It did not take Mr. Robb very long to adjust himself to these new conditions of affairs and in 1865 he erected a small foundry of his own at Amherst, Nova Scotia, and began the manufacture of stoves in this country. He may and he may not have had dreams of the huge scope his little business was to acquire, but that small foundry was the nucleus of one of Canada's large industrial plants whose product is known all over the world.

Besides the mere making of stoves, Mr. Robb used to do some machine work for the nearby lumber mills and other enterprises. This was slowly but steadily expanded until it embraced the manufacture of engines, boilers and other mill machinery. In the beginning their field was very limited on account of the lack of proper facilities for shipping their product, and consisted of that territory on the Bay of Fundy, the north shore of Nova Scotia, Prince Edward Island and the east shore of New Brunswick, all of which could be reached by water.

The manufacture of these varied lines (stoves and steam engines) continued until 1890-1, at which times two very disastrous fires occurred which nearly wiped the company out of existence. Upon the erection of new buildings the manufacture of stoves was completely dropped and all the energies of the company were concentrated on the building of engines and boilers, on account of their being in increasing demand throughout the whole Dominion, whereas the stove business did not show much more than local possibilities.

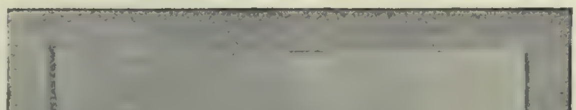


Fig. 1.—ALEXANDER ROBB,
Founder of Robb Engineering Co.

The inclinations of the present head of the company, Mr. D. W. Robb, no doubt, had a very strong influence on the change in policy of the firm, for he had a natural inclination for applied mechanics, and favored the making of

animate steam engines rather than mere inanimate stoves. This natural ability of his has been amply and continuously demonstrated in the development of the Robb-Armstrong engine, over which he has always exercised a careful surveillance.

The presence of the name Armstrong in the name of the engine is explained by the fact that a New Yorker, Mr. E. J. Armstrong, M.E., has given much assistance in its development and design.

shops and the foundry. These were not so large then as shown, but were added to as the rapidly increasing volume of business demanded.

The Main Building.

Until 1904 the long, narrow building marked machine shop and pattern shop was used both for the building of engines and the miscellaneous mill and repair work that the company still handles to some extent. The pattern shop

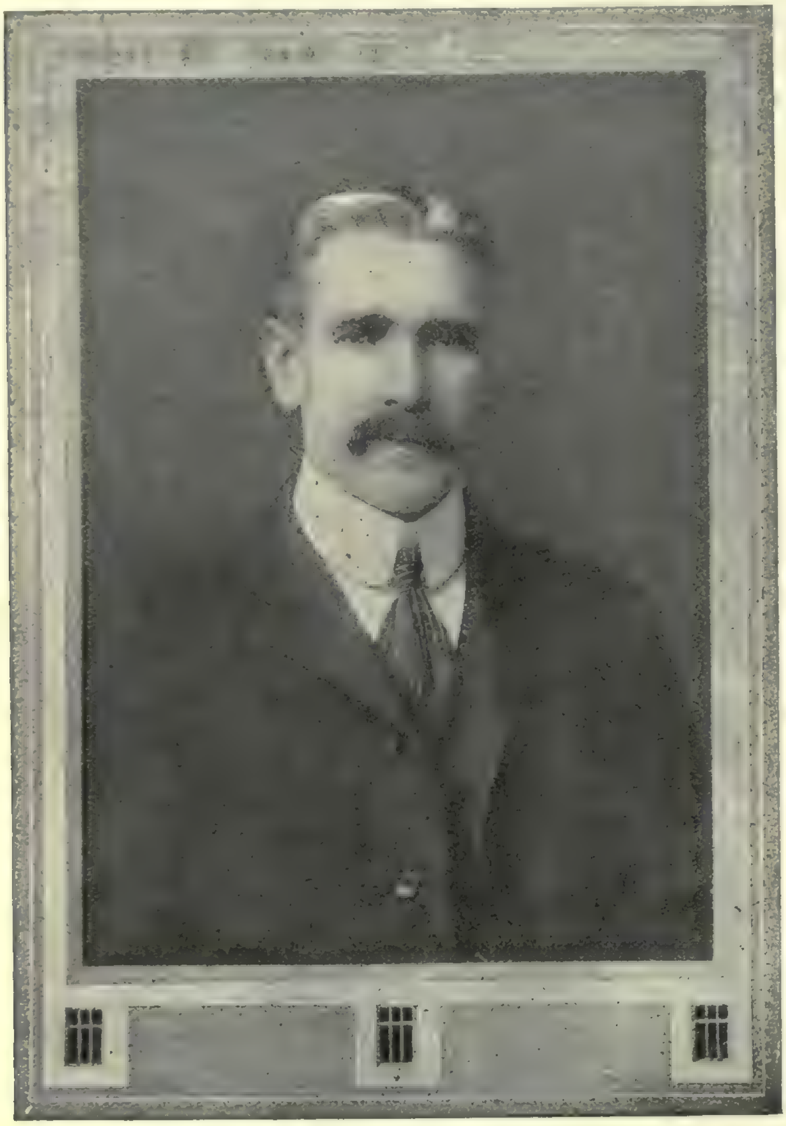


Fig. 2.—D. W. ROBB.
The Present Head of the Company.

The Buildings.

Reference to Fig. 3, the plan of the shops' layout, will show the arrangement of the buildings. The flanging shop is the old original foundry built by Alexander Robb, and which is shown in Fig, 8. Grown-up all around it are the larger modern shops, each one arranged so that extensions can be easily added as they may be needed. After the fires of 1890 and 1891 the new buildings were the boiler, machine, pattern, blacksmith

was, at that time, a small corner in the foundry. In this year was erected the spacious main machine shop, which is 100 feet wide by 250 feet long. This is of brick and wood, the roof trusses being made of heavy timbers. Along one side a gallery runs the whole length, and the front end of this, for about fifty feet, is given over to the executive offices. This position places them close to the producing departments, and as all the heavy machinery is on

the ground floor and near the further end little or no vibration is felt. Sound-proof walls insure quietness.

The main bay, which is given over to the erection and assembling of the engines, is served with a twenty-five-ton Niles electric crane. The heavier machines are ranged along one side of the bay, so that they, too, may be served by this crane.

The gallery is used for machines handling the small engine parts, and at one end is an annex, so to speak, of the general stores department. This can be seen in the background of Fig. 9. To the inspection department, part of which is shown in this photo, every piece is brought and subjected to a rigid inspection before being allowed to go to the stores. Every drawing comes with the pieces and the number of the drawing is stamped on every piece, no matter how small it may be. This greatly facilitates the preparation and shipment of duplicate parts. Every piece has a separate drawing of a standard size. These drawings (shop blue prints) are all kept in the tool room in drawers, in a vertical position, like a card index, and when one is taken from the drawer the receiver gives a check for it like he would for any tool. The tool room is on the gallery and serves the ground floor by means of a small hoist, which is raised and lowered by power. This power is supplied by an arrangement of counter-shafts, from the line shafting.

On this gallery are also the grinding machines. Every circular part of the engines is ground to an absolute perfect finish to gauges and templates, which insures interchangeability for all parts. The flat surfaces are also all scraped and ground on this floor to perfect, interchangeable fits. The company make most of their own standard gauges and have a very complete set. The Sweet measuring machine used in making these is shown at the right-hand side of Fig. 9.

On the ground floor are two interesting machines. One of these is a special machine used to turn up the face and bore out the hub of a pulley simultaneously, and the other is a special machine for boring the guides and journals and facing the cylinder end of an engine bed simultaneously. This building is heated by a hot air system installed by the Robb Company themselves, the air being drawn through the steam coils by a Buffalo fan driven by a small Robb-Armstrong engine. This system also serves the foundry and the blacksmith shop, the other shops being served by their own systems.

The Foundry and Blacksmith Shops.

These buildings, the foundry 100 by 200 feet, and the blacksmith shop 50 by 150 feet, are situated on and immedi-

ately adjacent to the north side of the machine shop, and are well-lighted, roomy shops. The foundry is built with a brick base and iron-clad wood above, the blacksmith shop being brick and wood. Both buildings have wooden roof construction. The main bay of the foundry is served with a Whiting electric crane of 15 tons capacity. The smaller bays are equipped with hand-controlled cranes supplied with air hoists, the cranes being built in the Robb shops.

The cupola house is right north of the foundry, and contains two cupolas built by the Robb Company, one having an hourly capacity of 15 tons and the other 4 tons. The supplies for the cupolas come into a basement arrangement at the back of the cupola house and are weighed and loaded on the hoist very handily.

Boiler Shop.

This is a wooden iron-clad building, 100 by 250 feet, with brick base. It is very high and roomy, with plenty of light at all seasons. The shop is served with a 15-ton Whiting electric crane, and contains an up-to-date equipment of boiler making tools, including rotary shears, beam drills, for rivet holes, etc. One of the features of the company's progressiveness is the fact that very few of the machines are old machines. The policy of the firm is to keep the shops supplied with new, up-to-the-minute machines, and as a consequence generally replace a machine every five or six years.

The "bull" riveter is a 10-ft. gap machine, allowing triple presslres to be used ranging 33, 66 and 100 tons on the rivet. Hydraulic power is supplied by a Northey three-plunger outside-packed pump, geared to a 50 h.p. motor, and supplies water at a pressure of 1,500 pounds per square inch. The electric power required for the air compressor, is taken form an outside source and is the only instance in the plant, all other power being supplied by the central plant mentioned later.

The air for the rivetting hammers, etc., is furnished by an Ingersoll-Sergent two-stage compressor, belt-driven from a motor.

The plates are all stored according to sizes in a bay of the boiler shop and are so arranged as to be easily gotten at and swung to the laying-out table. The boiler shop has been well systematized, and the store of standards and templates is such that the largest boiler can be placed on a car in a very few days after the order has reached the office.

Pattern Shop.

This is now in what was the old machine shop and contains all new and up-to-date tools. One of the newest and most useful tools is a Universal saw table made by Baker Bros. This can be used for so many varieties of work that it is very seldom idle, including in its category mitres and angles ready for the glue pot, as well as core boxes of almost any diameter. A sanding wheel made here in this shop, band-saws, planers, surfacers, etc., complete the equipment.

Second Machine Shop.

This is under the same roof as the pattern shop and is part of what was the old machine and erecting shop. Here it is that repairs are handled for other manufacturers, mills, etc., in the surrounding country, and other machine building to order is carried on.

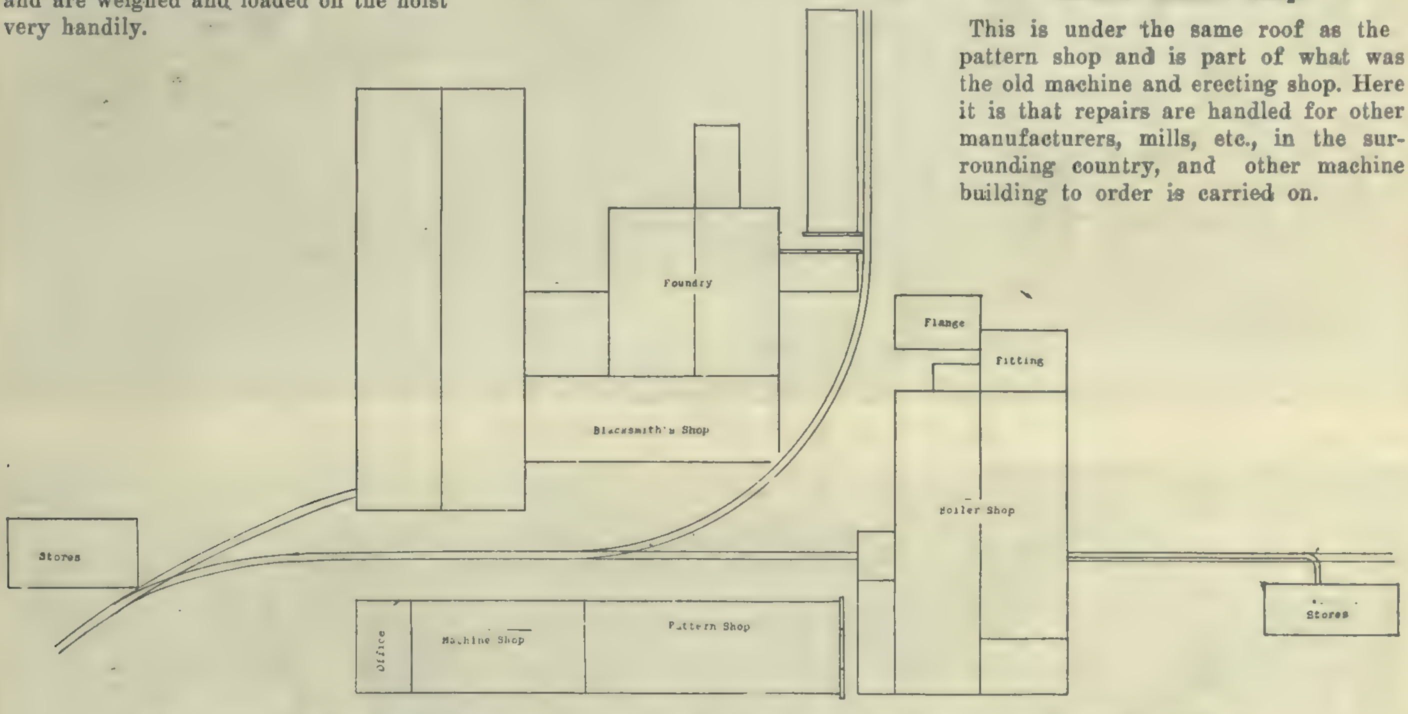


Fig. 3.—Layout Robb Engineering Works, Amherst. Large Building at the Upper Left Side is Machine Department.

The brass foundry and core ovens are conventiently located under the same roof as the foundry.

The blacksmith shop has a full complement, consisting of the usual quota of forges, steam hammer, etc. Air is supplied by a fan driven by a 15 h.p. Westinghouse motor. The steam hammer is adequate for any of the forging required on the heaviest engines the company builds.

The Flange Shop.

This is the original building of the Robb engineering building and which came through both fires unscathed. It was formerly the foundry, but it rapidly became too small for this work. It was then used as a store house, but different arrangements in the shops necessitated the stores being elsewhere, so it is now used as a flange shop.

Stores Department.

The boiler shop has its own separate stores building (see plan). This is two storeys in height and contains the stock of boiler tubes, nozzles, hand-hole covers, etc., etc., that it is necessary to keep on hand.

The main stores is quite separate from the other buildings, being across the street from the main shops. It is a very capacious building of dimensions 40 by 180 feet. It is served by a floor-controlled electric crane. This is also a retail store for steam supplies, such as power plants would need, although no attempt is made to stock anything outside of the ordinary lines such as they use themselves.

The Power Plant.

This is centrally located between the machine shop and the foundry and con-

Fig. 4.—Exterior of Main Machine and Erecting Shop.

Fig. 5.—Interior of Machine and Erecting Shop.

tains one 300 h.p. Robb-Armstrong simple Corliss engine direct connected to a General Electric generator, running 150 r.p.m. Steam is supplied by two Robb-

Fig. 6.—Interior View of the Machine Shop.

Mumford internally fired boilers at 150 pounds pressure. In the shops the machines are grouped with their own motors, while the larger machines are individually driven. The motors used are Westinghouse and Allis-Chalmers-Bullock in about equal numbers.

The various shops are all connected by a narrow-gauge industrial railway, and the I.C.R. switches are conveniently placed, so that all the loading can be done with the aid of the cranes. A telephone system connects each foreman's desk with the superintendent and a half-hour mail system for memos and orders has been in vogue for some time.

The work is all well systematized, but such care has been exercised in the establishing of these systems that they are almost automatic in their workings, requiring little if any additional clerical help.

The Time System.

The ideal shop system, as an assistant to the cost system, is a piece-work or piece-work and premium system, but the varied sorts of work that are carried on in the manufacture of engines and boilers of different designs and many sizes make it difficult to satisfactorily establish either one of these systems direct. It might so happen, in a premium system, that one man's rate would be low and another's high. The result that this state of affairs would tend to bring about would be the low man losing interest in his work merely finishing it without regard to time and the high man would naturally favor that job on which his premium was highest.

The Robb people tried both piece-work and premium system with unsatisfactory results. The management then set about to devise some scheme which would increase output, accuracy, quality, and at the same time allow the men better pay according as they did better and more work.

The result was that a short time ago a start was made on the system which is now in vogue. This has been gradually adjusting itself to embrace all conditions that might arise, and is now at the stage that may be said to represent a complete practical system of ascertaining the proper payment to the men for work done. It is in a way a premium system, but it also applies to that work upon which no time rate could be accurately placed.

In the Robb shops the engine work is all standard, but there are so many different sizes and styles made that there is not a large number of the same size parts going through at any one time. The way they work it is this: Suppose a man was given a certain number—say a dozen—of the same things to finish—connecting rods, for instance—a time rate could be placed on these, and if he finishes them inside the time limit he is credited with the time saved. This does not appear, however, in his next envelope, for reasons explained later.

Now, supposing he was given a job that was unusual, or that there was only one long bit of work on, such as boring out the guides and facing the cylinder end of an engine bed. He would not be given a set rate, but after the job is finished the foreman gives him a "percentage" If, in his opinion, the time was fast, the machinist would be allowed 105, 110 or up to 120 per cent., according to time taken. If the time was average, he would get 100 ; if slow, he might only get 90, or even 80, per cent. Then,

Fig. 7.—Gallery of Main Shop.

if it had taken him ten hours, and he was allowed 120 per cent., the premium or time saved is reckoned as though

there had been a time rate set on the job of $10 \times \frac{120}{100}$ or 12 hours, and the machinist is credited with two hours. The man is also given a percentage for quality of work and for attendance.

At the end of every three months the number of hours saved is totaled and from this is deducted the number of holrs lost, and the net saving is multiplied by the man's rate per hour, which shows the value of the time saved during the three months. His rate is then raised, so that in the next three months he will get in wages the amount saved.

This is fair to both men and company. In the old premium system, if a man took 15 hours on a 10-hour job the company would be the loser, while on the time saved the man would only get half his rate. Now the man gets his full rate on time saved and the company gets credit for time lost. This system is working out very satisfactorily and dovetails nicely with the simple cost system in vogue, which is explained in detail elsewhere. The men all "ring in" their own cards, both time and job, on clocks furnished by the International Time Recording Company.

Fig. 8.—Original Foundry, Built in 1865.

James R. Kinghorn has resigned his position of assistant general manager of the Montreal Rolling Mills, and is leaving for British Columbia. He was formerly connected with the sales department. Mr. Kinghorn's departure will necessitate the election of a successor to fill his place as vice-chairman of the Transportation Bureau of the Montreal Board of Trade, with which body he has been connected for the past ten years.

L. B. Orchard has been appointed chemist to the Atikokan Iron Co., Port Arthur, Ont.

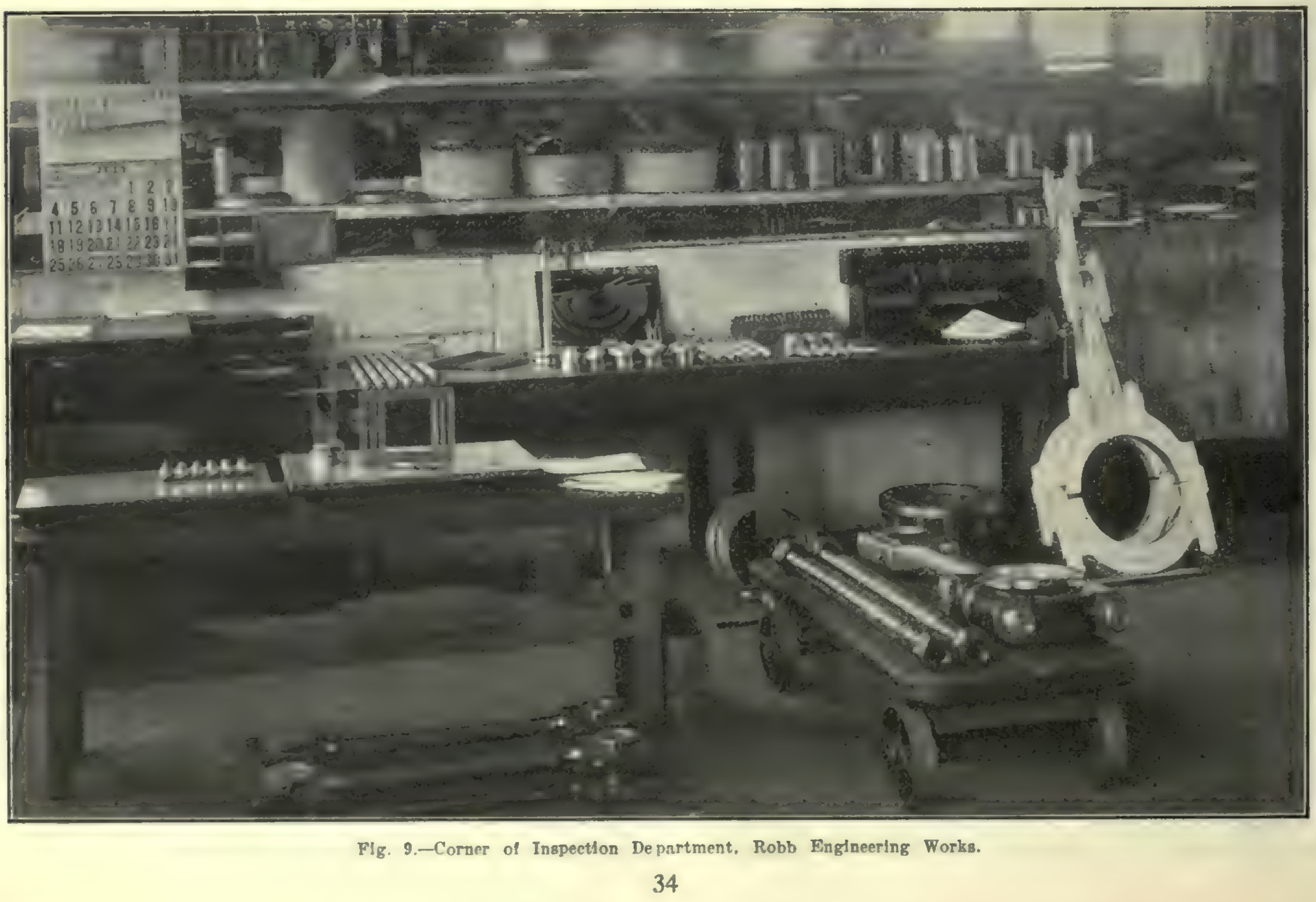


Fig. 9.—Corner of Inspection Department, Robb Engineering Works.

Limit Gauges; Their Relation to Cost of Production

A Practical Article on the Use of Gauges in the Machine Department, Reviewing Classes of Gauges, Gauge Limits and Gauge Standards.

By ARTHUR S. ELLERTON, A.M.I.C.E.

The use of limit gauges in engineering works is apt to be regarded with something of suspicion and awe by those who have not had the opportunity of judging their real ability. In industries involving a rapid and cheap production of a large number of interchangeable parts that have to be assembled to form a machine, the cost of each operation must be accurately known and reduced

Fig. 1.

to the minimum amount if commercial success is to be obtained; and undue share of costs is often absorbed in the final fitting and assembling operations.

If the output of the factory is strained to its limit owing to brisk demand and limited plant or space, it will usually be found that one particular department is working at a higher pressure than the others, particularly the before-mentioned fitting and assembling departments.

On careful enquiry into the causes, the superintendent will often find that these departments are working overtime and also grumbling at the amount of fitting and unnecessary operations that certain parts require.

The fine work is done in the machine shop, modern machine tools are designed with this end in view and to use them for rough work is sheer waste of money. It will be found that work can be done to almost any degree of exactitude on a good machine tool; and it only remains

Fig. 2.

to fix for the work in hand, the minimum degree of fineness that will suffice for the rapid handling and erecting of the several parts of the machine under construction.

Cost of machining must be balanced against cost of fitting and it will require no great amount of persuasion to convince the economist that metal can be removed quicker and more accurately on a machine than in the vice. No work however fine can be produced without an error either great or small, and the object at which we aim is to produce a dimension that will be sufficiently near the theoretical size shown on the drawing for practical purposes.

The drafting room is always ready to put an exact size on the drawing after giving the diameter of a shaft or hole to the ten thousandth part of an inch, i.e., four places of decimals. But we do not accuse them of expecting the machine shop to work to them. The cost would of course be prohibitive. We must on this account fix a limit of error on all our work and the inspection department must be made to rigidly enforce the adherence to those limits. Objections will be raised to this, the machine shop foreman will probably complain, saying why reject a job for the sake of .002 inch, etc. This brings us to the importance of selecting proper

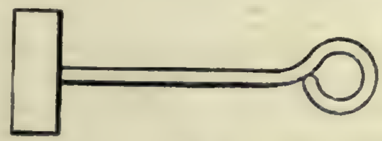


Fig. 3.

limits for our work; it will be seen at once that most of the dimensions are comparatively unimportant with regard to the few whereon we impose fine limits. Automobile work affords a typical example of the advantageous use of limits and the limit gauge. Take for example an automobile cylinder; the chief dimension is the diameter of the bore; here we can limit the error on the diameter to a total of only .003 and not be asking too much of our machine shop.

We can however impose a limit of say .025 inch on the thickness of the bottom flange and no one will complain that it is too far from correct size. If we do not tell our workman that he is to work to limits we only say "This flange does not matter, it's not important," and he forms his own opinion to the meaning of the phrase. He goes ahead and produces a few flanges dead on size, the rest varying from say—.050" to +.050" and one will come out say —.125" and all he will say in explanation is, that "the foreman said it was not important" and you can say nothing to the man because he is right for all that. Give him a limit of +or—.010 and he can quite easily produce them all to this and just as quickly. In adjusting limits, the salient point is to make them as large as possible consistent with practical requirements.

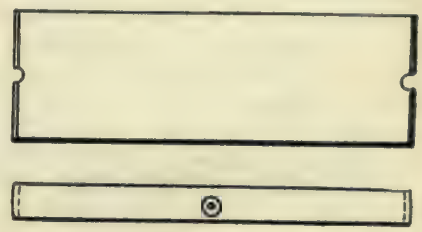


Fig. 4.

Standards

Limit gauges can be divided into 2 classes. Those made on "hole basis" and those made on shaft basis. This latter although advocated by good authorities as the standard basis, may however, be immediately dismissed as practical experience proves the former to be better. By "hole basis" is meant that all holes are to be regarded as standard size and all shafts are to be adjusted to fit the hole according to the duty required of the combination. Take as an example a journal bearing, this is bored to the standard size (the method of producing this standard is explained hereafter) and the journal is turned to a "run fit," that is is smaller than hole by an amount and absence of undue shake. It will be previously determined as a suitable allowance for lubrication, ease of rotation,

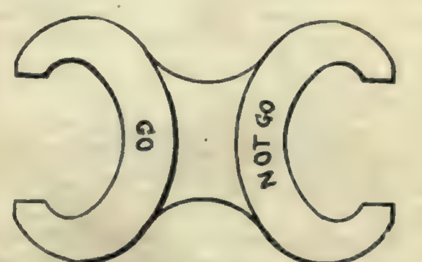


Fig. 5.

obvious that it is commercially a far simpler matter to make a shaft fit a hole than to make the hole fit the shaft, hence the adoption of the "hole basis." We produce the hole either by means of a reamer or an abrasive wheel to stand-

ard size. This standard is a size limited in its error from the normal dimension by an amount proportional to this latter size and commercial possibilities of production, which in its turn can only be found from practical experience.

Usually two "hole basis" may be formed one for fine work such as tools and jigs, sewing machines, gun, pistol and torpedo work and may be designated as Class A. Another for rougher work such as automobiles, engines, agricultural machinery, etc. This may be designated as Class B. For sizes up to six inches limit gauges may conveniently be made of the double ended plug form as shown in Fig. 1 or the method of separate gauges for high and low limits mounted on slender wire handles, as shown in Figs. 2 and 3. For holes above 6 inches bar gauges are suitable, such as Fig. 4. The gauge in Fig. 1 is made with one end A to the low limit, and no standard hole must be smaller than this, and the other end B is made to the high limit, than which no standard hole must be

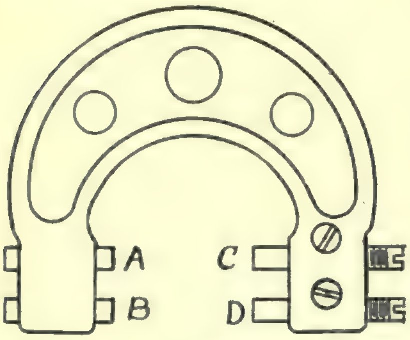


Fig. 6.

larger. The small end A is known as the "go" and the other end B as the "not go" end. Too great a stress cannot be laid on the fact that, however loosely the "go" end fits the hole, provided the "not go" end will not enter then the hole is standard size.

The adoption of the wise handled gauges (before mentioned) has been rendered necessary to prevent the habit of forcing the "go end" into a hole that is just too small to receive it, and thus causing undue wear on the gauge. Plug limit gauges made on this plan will outlast three or four solid gauges that can be firmly grasped and forced into the hole.

If the limits selected prove themselves too fine, make them bigger until the correct balance is reached, and to hold to these as the basis of your system. We will presume now that all holes can be produced to the commercial standard of accuracy fixed by our plug limit gauges. Now we can proceed with the manufacture of shafts and spindles to fit these holes in accordance with the duty required of them. Broadly speaking, shafts are divided into two classes. (1) the run fit, (2) the drive fit, but here again practical requirements demand finer subdividing.

The drive fits can be divided into three sections, viz.:

Force fits...... .... Class "f"
Driving fits .... Class "d"
Push fits .... Class "p"

In like manner the running fits may be divided into three grades. Classes X.Y.Z.

Fig. 7.

The table "A" shows a suitable range of limits for holes up to 6 inches dia. The difference between the top and bottom limits is the bolerance or working allowance. For sizes alone 6 inches the limits may be calculated from the table "B".

The sizing of the shaft is done by selecting the class required and using the limits called for by the same; e.g., supposing we have to fit a shaft to a two inch hole, and the drawing calls for a "run fit" Class X. We select a snap limit gauge having the "go end" two inches —.00175; this represents the high limit and the "not go" end or low limit will be two inches —.0035. We now reduce our shaft until it is small enough for the high limit end of the gauge to pass over but not so small as to allow the low limit end to do so. This shaft will not fit any two inch hole made to limit gauge. The importance of the interchangeability thus acquired needs no recommendation in producing repetitiion work.

Two forms of snap limit gauge are in general use, viz.: the fixed gauge as shown in Fig. 5 and the adjustable as shown in Fig. 6. Fig. 5 is self explanatory. In the adjustable gauge we have frame of horse shoe type, carrying two fixed anvils A and B and two adjustable C and D. The space between B and D is adjusted to the high limit and between

Fig. 8.

A and C to the low limit. To effect this a setting bar (as shown on Fig. 7) is used. In using this gauge we reduce the shaft until the gap B-D will pass over but the gap a-c will not pass over.

Use of Limit Gauges.

Limit gauges can be used with advantage in checking machine screws, bolts and nuts. Of gauging the size of threads, the ordinary plug and ring screw gauges are of very little real use owing to the very wide degree of variation caused by the user's idea of direction in the matter of fits. The gauge shown in Fig. 8 will however keep the tapped holes within definite prearranged limits. Here as in ordinary plug gauges we have a double ended gauge made to high and low limit. Fig. 9, an improved form of female gauge. The end "A" is a simple snap limit gauge for sizing the stock to be screwed. The other end "B" is formed with one jaw stepped, the lower step differing from the higher by the amount equal to the tolerance to be allowed on the diameter of the screw. The other jaw is formed with parallel grooves milled to the thread form, so that the screw being gauged, will pass along the jaw as far as the step and no farther, and not only will the diameter be gauged, but also the form of the thread itself. Screwed work can be gauged in this manner in one-tenth of the time required to screw a ring gauge on or off.

In the inspection room, itself a non-productive department, a large amount of

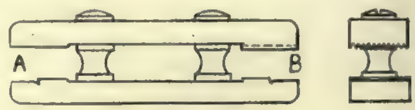


Fig. 9.

time may be saved by examining work to the limits called for and not calipering every job to the 1-1000 of an inch. Actual examples have shown that 30 per cent. can be saved in time in the inspection room by the use of limit gauges.

Favorable reports in making high-speed steels, according to a writer in "Stahl and Eisen," were obtained with powdered ferro-tungsten produced by Chemische Fabrik Fuerth. Analyses show that it contains 85 per cent. of tungsten, 0.30 carbon, 0.45 silicon, 0.45 manganese, 0.25 aluminum, calcium and magnesium, and 0.01 of sulphur. Tin, phosphorus, copper and arsenic could not be detected. Ferro-tungsten melts at consideraqly lower temperature than tungsten metal, and it is far less subject to oxidation than the pure metal. Slagging of the tungsten is low, so that the loss of this dear metal is almost nil. The powdered ferro-tungsten alloys more readily. The segregation is less and the steel is not so much subject to piping.

It is said that there are people who believe that you can make money selling below cost provided you sell large enough quantities.

A Number of Applications of Double Ball - Bearings

Chapman Double Ball Bearing Co., Toronto, Have Improved their Standard Lines and Increased the Number of Applications of Double Ball-Bearings

Primarily the use of ball bearings was confined to bicycles and other light forms of transmitting power. Within the last few years however, the design and method of manufacturing has undergone a complete change, which makes their application to general power transmission a valuable achievement of modern engineering by doing one of two things or a combination of the two, viz.:

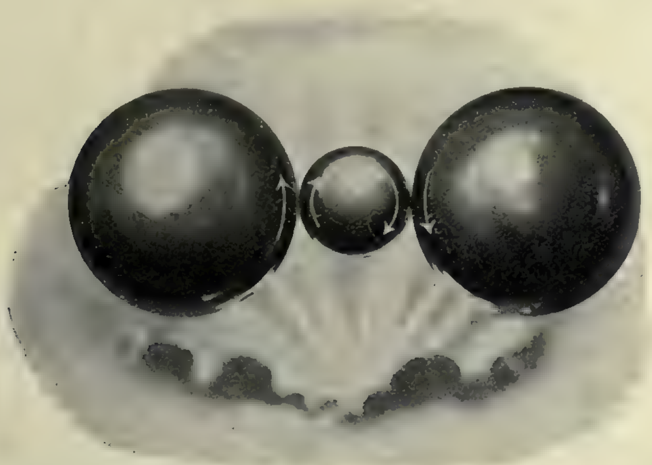


Fig. 1.—Double Ball-bearing.

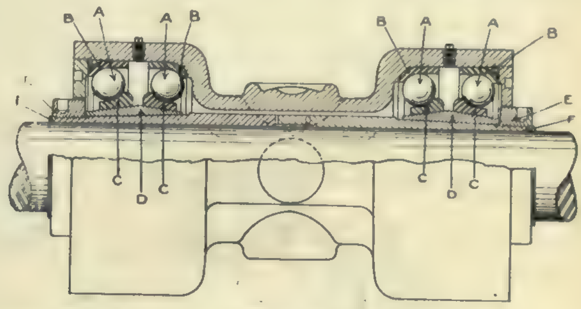


Fig. 3.—Double Ball-bearing for Extra Heavy Duty.

(1) Reducing the amount of power consumed by eliminating friction, and this frection represents power loss during the transmission from the engine or other source of power developed by the use of the method of revolving a shaft in anti-friction-metal lined supports; (2) By the actual delivery to the machine or machines practically all of the power delivered from the source of supply.

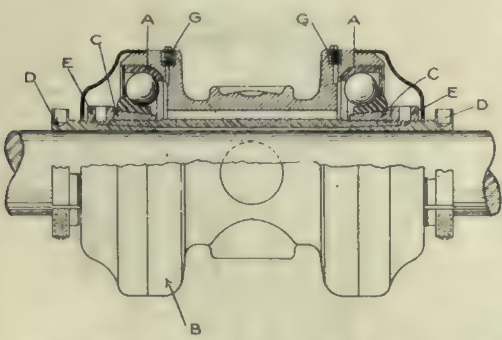


Fig. 2.—New Standard Double Ball Shafting Bearing.

Ball bearings can and are being constantly applied to all classes of service from light loads to the heaviest loads, and from slow speeds to the highest speeds used in engineering practice, and are giving good results both in point of durability and power saving. These results of course can only be attained throught the ball bearing manufacturers receiving all of the necessary data regarding the conditions under which they will be required to operate.

It is just as necessary for the ball bearing manufacturer to know the conditions under which the ball bearings are to operate (enabling him to supply the proper type of bearing) as it is for the machine designer to know the stresses and strains which will be developed in the machine under consideration.

In designing a machine which has rotating parts attention is always paid to the speed of rotaation and the pressure on the part supporting the rotating part, and the proper allowances are made for surface supports, and lubrication. For instance if the load is extremely light, the part is supported on a pivot point. if the load is very heavy the part is supported on as large a surface as possible. giving due regard to keeping the surface speed of the contacting parts as low as possible, and at the same time maintaining the necessary stiffness in the rotating parts. These fundamental principles also apply to the application of ball bearings (to a certain extent) viz: it is always necessary to know the load and speed under which the bearing is to operate to insure its durability, and its efficiency as a power saver, for the following reasons:—

(1) The diameter of the ball (as has been reported upon and accepted by eminent engineers and since been proven in practice controls the sustaining power of the bearing.

(2) It is always necessary to keep the surface speed of the balls or rotating raceway as low as possible giving due regard to the number of balls employed.

The actual strength of a ball bearing is not in the ball itself as much as in the stationary race (that is if both ball and race are constructed of the same material and of the same strength) the stationary race is the weak point inasmuch as it is subjected to the load at least (in general practice) five times as often as the ball, as the suporting part is subjected to the load every time a ball under load comes in contact with it. This, of course, causes fatigue in the stationary race first, as it gives the ball more time to recuperate from the effects of the load.

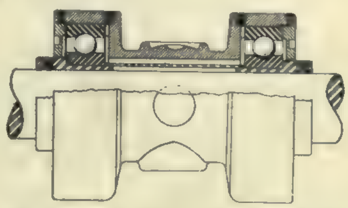


Fig. 4.—High Speed Shafting Bearing.

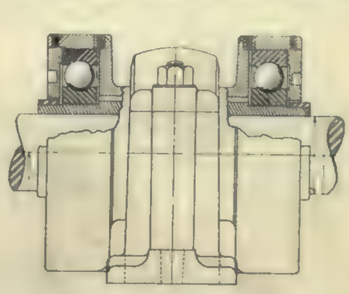


Fig. 5.—Double Annular Bearing in Ball and Socket Pillow Block.

The main reason that the ball controls the sustaining power of the bearing is because the increased diameter neces-

sarily produces a greater contact and consequently a less liability to indentation in both ball and race, and a measurable amount of permanent indentation is fatal to the bearing, but a race or ball

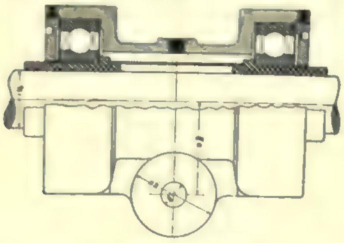


Fig. 6.—Double Annular Bearing for Pressure Blowers and Exhaust Fans.

may be indented to a certain extent, providing that the material has enough elasticity and time to recuperate without fatigue.

In regard to lubrication of ball bearings this is absolutely necessary, al-

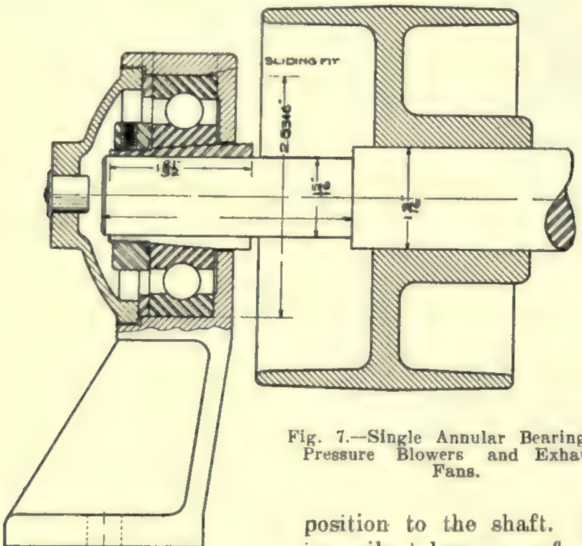


Fig. 7.—Single Annular Bearing for Pressure Blowers and Exhaust Fans.

though they do not need as much lubrication as the ordinary bearing still they need enough to tend to isolate the contacting parts which rub against one another. Lubrication is necessary for the following reasons:

(1) In the ordinary ball bearing without a cage or ball separator the balls

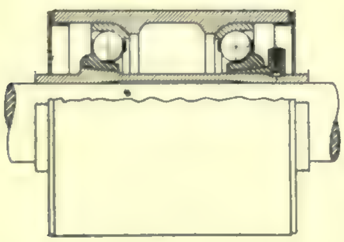


Fig. 8.—Double Ball-bearing Loose Pulley.

when in motion will come in contact with one another, and if a lubricant is not present a certain amount of wear will take place on the balls.

(2) In the ball bearing containing a separator or cage, the cage will wear if there is no lubricant between the balls and cage or separator.

(3) It is always necessary to ensure the bearing against dampness, which means rusting and consequent deterioration.

It is always necessary to use a lubricant that contains no acid that will in any way attack the surfaces of the balls or raceways, and to always protect them in every way possible to ensure their durability.

In regard to installation, although a ball bearing may run free and appear all right in its hanger, or other holding device, care should be taken to see that it is free to align itself to any position the shaft may take, due to deflection by the belt pull, or sag of supporting floors, or any change whatever, that would cause it to be out of ts proper relative position to the shaft. This of course is easily taken care of with the use of self aligning hangers or supports, severall of which are on the market. Of course in machine construction it is not necessary to provide for the self alignment feature, provinding the supporting parts and shaft are stiff enough to overcome any tendency to spring.

Ball bearing are now in use and have been operating for nearly six years in Canada on head shafts, line shafting, counter shafts, loose pulleys, friction clutches, cut off clutches, fans, polishing machines, mule stands, grinders, flour mill rolls, travelling and stationery cranes, all types of fans, vehicles, mine cars, gas and gasoline engines, motors, generators, saw mandrels; in fact almost every type of appliance consisting of rotating parts, and making large savings of its power loss due to friction.

The shafting bearing for ordinary purposes is shown in Fig. 2. In this bearing there are two rows of balls, one row in each end. The outer races A are held in position by the housing B, the inner races are held in position by the wedge C, and the bearing proper is adapted to different sizes of shaft by using different bushings of a suitable bore at D. These bushings are screwed

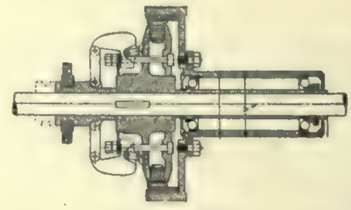


Fig. 9.—New Double Ball Friction Clutch Pulley.

into each end of the sleeves at E and being split and tapered on the outside and the sleeve F being bored a corresponding taper by screwing them in, they are collapsed to fit the shaft. Lubrication holes are provided at G.

The head shaft bearing is shown at Fig. 3. In this bearing there are four rows of balls A, two rows in each end.

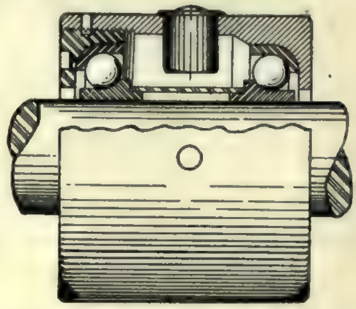


Fig. 10.—Light Shafting Bearing for Power Tables, Sewing Machines, etc.

The outer races B are held as in the ordinary type, the inner races C are forced onto the bushing D having two opposed tapers, and the inner races are fastened to the shaft by screwing up the ring nuts E on each end, thereby drawing out the sleeve F in each end, and they, being

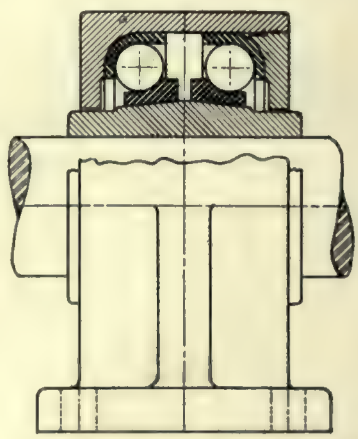


Fig. 11.—Rigid Pillow Block.

tapered and split, cause them to collapse and permanently contact with the shaft. Both of these bearings are built in different styles of housings to adapt

them to the different makes of hangers now on the market.

Fig. 4 shows the so-called annular type of bearing adapted to heavy work under high speeds. The method of fastening the inner race to the shaft is somewhat similar to that used in the head shaft bearing.

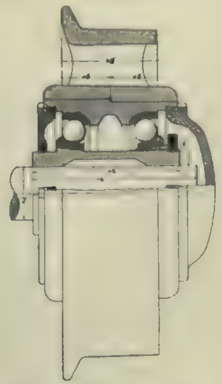


Fig. 12.—Mining, Shop and Light Car Wheels.

Fig. 5 shows the same bearing adapted to a ball and socket pillow block. Fig. 6 shows the same type of bearing adapted to double exhaust fans. Fig. 7 shows the same bearing adapted to pressure blowers. A combination of Figs. 6 and 7 is used on single exhaust fans of all types.

Fig. 8 shows a ball bearing loose pulley bushing. This bushing is simply slipped on the shaft and the pulley clamped on to it. This type is also used for mule stand pulleys.

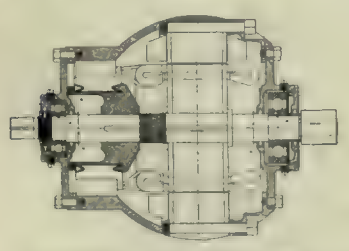


Fig. 14.—Applied to Electric Motors and Dynamos.

Fig. 9 shows a ball bearing sleeve attached to a friction clutch. These sleeves are made to fit any standard clutch. The liability of friction clutch sleeves to stick and seize to the shaft or else become so badly worn that they lose the greater part of their driving power has until now been the bugbear of these clutches, but now by the use of properly designed ball bearing sleeves these difficulties have all been eliminated. This is a new application of double ball bearings.

Fig. 10 shows a bearing for light shafting purposes used in whitewear, knitting and shoe factories. Fig. 11

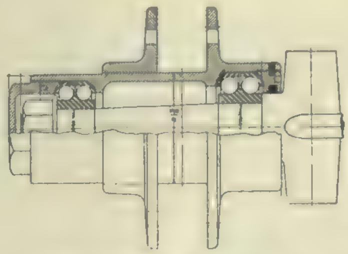


Fig. 15.—Fitted to Metal Hub.

shows a rigid pillow block bearing used on heavy slow speed machine work. Fig. 12 shows a mine or ore car wheel which has come into very prominent favor with mining concerns. Fig. 13 shows a ball bearing trolley base for street cars. This has eliminated the trolley wire breakages due to stiff swinging

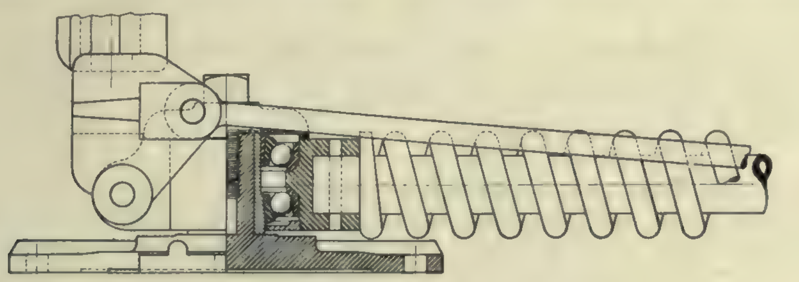


Fig. 13.—Double Ball-bearing Adapted to Trolley Bases.

poles. Fig. 14 shows a ball bearing motor or generator. This construction allows for the lateral movement of the commutater.

Fig. 15 show a ball bearing artillery hub for vehicles, and Fig. 16 shows the same bearing fitted to a patent hub, and in use on automobile front wheels. Fig. 17 shows the application of a ball bearing for thrust purposes as used on vertical shafts, clay grinders, etc. Fig. 18 shows the same bearing for use in motor boats and general thrust purposes on horizontal shafts.

In all of the above types of ball bearing no provision is made for adjustment for wear, as the makers supply these bearings of a sufficient strength to ensure their life being at least as long as the life of the machine or other appliance they are supplied for.

Ball bearings to-day consist of three classes or types, i.e., the so-called cup and cone type as shown in Figs. 1, 2, 7, 8, 9, 10, 12, 13, 15, and 16. The annular type as shown in Figs. 3, 4, 5, 6, 14, 20 and the thrust type as shown in Figs. 17 and 18. All of these types of bearings illustrated have raceways hav-

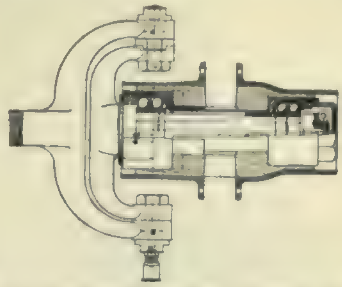


Fig. 16.—Automobile Steering Knuckle and Hub.

ing a curvature very nearly approaching that of the ball. This feature alone, has given ball bearings a durability easily three times that resulting from the older type of a point contact between the balls and race.

In both types the manufacturers aim toward producing bearings having two only contrasting lines between the ball and race, the centres of these contacting lines to be at right angles to the rotating shaft so as to reduce the tend-

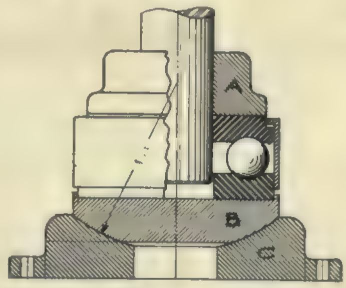


Fig. 17.—Step-bearing.

ency of the balls to twist and cause a boring effect in one of the races due to the difference in the surface speed caused by any angular contact other than a right angle contact.

In Figs. 1, 2, 7, 8, 9, 10, 12, 13, 15, and 16 there is an apparent means for adjustment, but this is only intended to be used at the time of assembling to take care of any variation in the manufacture of the parts governing the distance between the rows of balls. It is not intended, nor is it used as a means

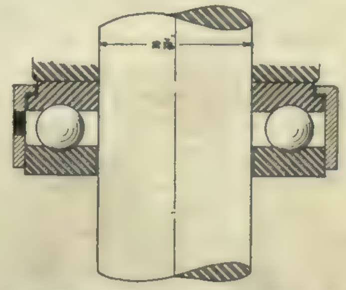


Fig. 18.—Thrust-bearing for Worm Gear.

of taking care of the difference in the diameter of the races or ball. These are all made to gauge sizes and must

be duplicated to within 1-10,000 part of an inch. If these bearings are adjusted in an attempt to overcome the result of wear they are made worse than ever, (1) because the stationary race will be worn on about one-fifth of its surface only, making it impossible to adjust the bearing to a circular race. (2) The revolving race will be worn so as to cause the ball to ride on it at an angle that will not be at a right angle to the shaft. There is only one cure, viz: a bearing suitable for the purpose.

During the installation of ball bearings, care should be taken to see that the place on the shaft where the ball bearing fits, is up to full size and parallel, otherwise there will be a local action between the sleeve and the shaft eventually causing a hammering action, which will either reduce the size of the shaft or increase the bore of the sleeve, possibly both. This has happened in a number of cases, and of course the ball bearings were to blame (in the opinion of the customer) even though the balls and races did not show the least sign of wear. It should always be borne in mind that a proper lubricant should be used on ball bearings. Ball bearings have operating with so-called lubricants that were not as good as the lowest grade of axle grease. Outside of acid effects on the balls and races, this is extremely detrimental to the bearings, as these so-called lubricants clog up the rotatory parts to such an extent as to cause them to lose all of their power saving ability, and are consequently worse than useless. There are some cases where the bearings have been running for over four years without any lubricant or attention whatever. To say the least these people have not much respect for the money invested.

In all ball bearings there is some means provided for lubrication and due to the fact that a large quantity of bearings are handled through dealers, it is often the case that the manufacturer's instructions do not reach the customer, consequently he is not advised regarding the instalation and care of the bearings. It will always pay the customer to enquire of the manufacturer in regard to the proper treatment to be given the bearings before instaling them.

In regard to lubrication holes, there are some cases where the lubrication holes have been drilled straight in part way and then cross-drilled to lead the lubricant to the proper place, and where the man in charge tried to see the balls and failing that, tried to feel them with a wire. Not being able to get in touch with them, he thought they were blind holes and failed to give them any more attention, even though the lubricant kept on going in as long as he supplied it. It is not necessary to keep the ball bearings so flooded with lubricant as to cause it to flow all over, but it is absolutely necessary to make sure that the balls and other parts are thoroughly coated.

Notes on Manufacture and Upkeep of Milling Cutters*

Quality of Steel, Method of Hardening, Care and Accuracy in Making New Cutters, and Facility and Correctness in Grinding the Cutters.

By DR. H. T. ASHTON

Although the system of manufacture of milling cutters detailed in this paper is suitable for general application, it has been developed more particularly to meet the difficulties of extending the use of high-speed steel to milling cutters of complicated shape, required when cutting to give an accurate finish and a good surface. It is believed that these difficulties have been commonly met with, and that owing to them the general introduction of high-speed steels of the Taylor-White class has, so far, generally proved of less benefit to engineers for milling cutters than for any other form of cutting tool used in engineering workshops.

Perhaps the advantages to be obtained by the use of high-speed steels for such cutters are also not so obvious as they are for the heavy lathe or planer tools, where the almost red-hot chips, that they can be made to produce, appeal to the least observant onlooker. When, however, it is considered that this class of steel not only has the property of keeping a cutting edge for a reasonable time when taking very heavy cuts at a previously unattainable speed, but also keeps its cutting edge when used with a moderate cut and speed for a far longer period than was previously obtainable, its advantages, if applicable to complicated milling cutters, are clearly just as great as for the simpler tools taking the heavy cuts. For, although the nature of the work upon which the cut is taken and the finish required from the cut may not allow, in the case of the milling cutter, any great increase of speed or feed by the use of high-speed steel, and consequently little direct sav-

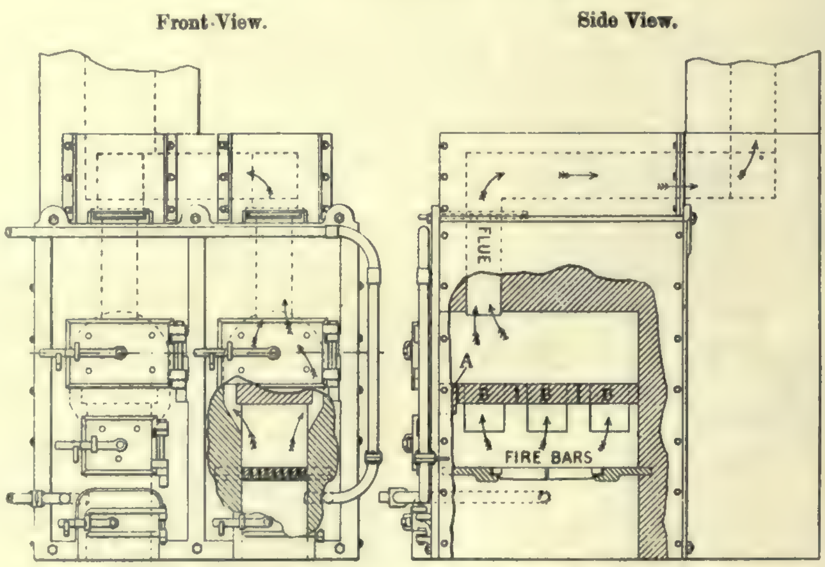


Fig. 1.—Hardening Furnace for Cutters of High Speed Steel.

* Paper read before the British Institution of Mechanical Engineers.

Several foremen in Canadian shops have intimated to the editor of Canadian Machinery that mechanics are not as familiar as they might be, with the making of cutting tools. We trust mechanics will peruse this article with interest as it contains valuable information—Editor.

ing upon the time occupied in doing the work, as in the cases of the other classes of tools, yet an equally important saving is effected upon the cost of supply of the tools themselves. The milling cutter is the most expensive of all the tools used by engineers in cutting metals. In the simplest milling cutter the cost of workmanship so largely exceeds the cost of material that a moderate increase of life obtained by improvements in the raw material far outweighs a considerable increase in its original cost, provided that there is sufficient work in sight for the cutter to ensure its being fully employed for its maximum possible life. Perhaps it is this ruling condition which has led to somewhat less attention being paid to the application of these steels to milling cutters in general engineering workshops than to other cutting tools. For in these, with the exception of a few simple cutters generally useful for roughing out or for finishing simple profiles likely to recur, it has perhaps generally been more economical to make the cutters from ordinary qualities of tool steel, or even in some cases from case-hardened mild steel; hence the preparation of an elaborate milling cutter from high-speed steel has not received quite the same general attention as the preparation of other cutting tools of maximum endurance.

The case, however, is different in a number of workshops where the interchangeable parts of many classes of apparatus and fittings depend very largely upon the use of formed milling cutters, and where the accuracy of the work so produced is directly dependent upon the accuracy with which the form of the cutter can be maintained for a prolonged period. It is desirable also that the cutters should have as long a life as possible in actual service, not only to minimize the first cost and upkeep, but also to keep the output of the machines as continuous as possible, by reason of freedom from delays in changing the cutters. These points depend chiefly upon:

(1) The quality of steel from which they are made.

(2) The method of hardening adopted.

(3) The care and accuracy with which the new cutters are made.

(4) The facility and correctness with which the cutters can be ground up when they have become dull or lost their accuracy.

Fig. 2.—Air Hardening Table.

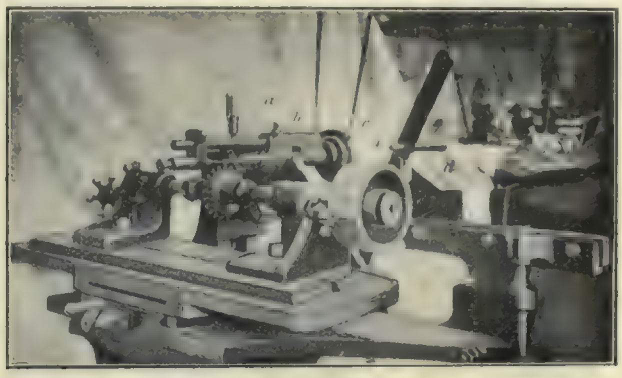


Fig. 3.—Backing-off Cutter-teeth With Tracing- pin and Former.

Fig. 4.—Back View of 3.

Fig. 5.—Backing.off Cutter-teeth, Using a Spiral Slot.

The Steel Used.

There is, of course, nothing to compare with the recently-developed high-speed steels as a material for cutters which are required to work at a high cutting speed and have the maximum possible life; and no difficulty is now experienced in obtaining work with a sufficiently satisfactory finish, provided care is exercised in the grinding and finishing of the cuters, in a manner which will be described, and also if the cutting speeds and feeds are suitably arranged. Any of the best known makes of this class of steel can be used in conjunction with the system to be described.

The milling cuters are annealed, packed in spend powdered charcoal and steel turnings in cast iron pans with covers which are luted down. These are placed in the annealing furnace first thing in a morning and are gradually heated up to 700 degrees C. to 750 degrees C., this heat is reached by one o'clock and is maintained until about 5 o'clock, when the dampers are closed and the furnace is allowed to cool gradually for 48 hours. It is found that some makes of high-speed steel are satisfactorily annealed by the makers, but it is not the universal practice. Annealing in this manner is found to give thoroughly satisfactory results.

The furnace used for hardening cutters is shown in Fig. 1 and Fig. 2, and it has been found especially adapted for obtaining a soaking heat, together with the high temperature necessary in treating this class of steel and freedom from oxidation. The furnace is cooke-fired and has a forced draught and temperatures up to 2,300 degrees F. can be obtained.

In using the furnace the cutters are packed closely in powdered charcoal in sheet steel boxes about 6 inches by 6 inches by 3 inches. These boxes take

from 2¾ to 3 hours to reach the necessary hardening temperature, the time taken varying with the weight of metal to be heated. The hardening temperature varies somewhat according to the class of steel being used, but may be said to be between 2,000 degrees F. and 2,100 degrees F. The exact temperature necessary for satisfactorily hardening any particular class of steel is previously determined in the laboratory by exact experiments, and the temperatures obtained in the furnace are checked by means of a Fery radiation pyrometer—also shown in Fig. 2. This pyrometer is itself tested against a standardized Callendar pyrometer, and has so far been found to give extremely reliable results.

The cutters when sufficiently heated are quickly removed from the charcoal in which they have been packed, and are at once placed upon the hardening table shown in Fig. 3. This table is of a type frequently used in workshops for heating tools by gas, but when used for hardening cutters, air only is supplied through the two nozzles. These can be moved as required about vertical pivots so as to cause the air-blast to impinge upon the periphery of the cutters at any required points and simultaneously upon the vanes of the spindle upon which the cutter is placed, causing the whole arrangement to rotate and thus equalizing the cooling and hardening effect. The air delivered upon the cutter is drawn from an old culvert, which passes under the floor of the workshop and through which a stream of water continually flows; hence at all times of the year a supply of cold, damp air of maximum cooling effect is available. The temperatures used in hardening are such that the edges of the cutters are almost fused, and although different makes of steel have been found to vary somewhat in this respect, the general statement remains true of all of them. At the same time it is found that this fusing effect for a given heat is considerably minimized by the method of heating in closed boxes as compared with the ordinary method of heating tools, either in a muffle or in a direct gas-flame, and even the scaling, which, with the latter systems is frequently very marked, is, with the mehod now described, so s'ight that the cutters can be wholly freed from scale by placing momentarily under a revolving scratch brush.

Fig. 6.—Back View of 5.

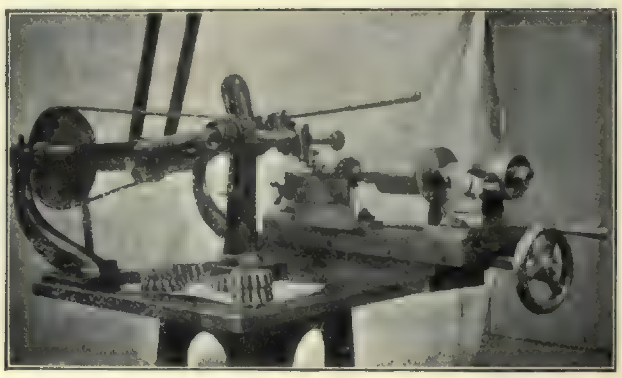


Fig. 7.—Grinding Cutters.

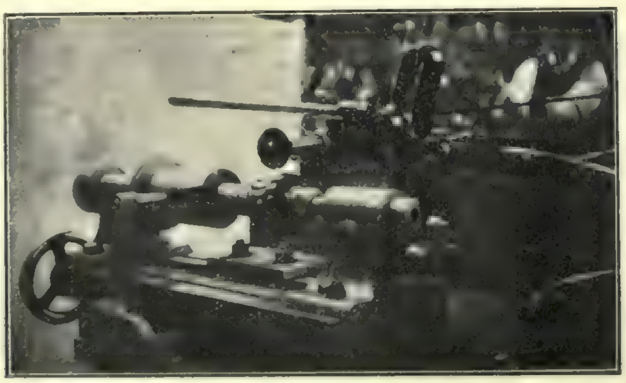


Fig. 8.—Grinding Cutters.

All difficulties as regards the expansion of the hole through the cuters in hardening are met initially, leaving the bore slightly smaller than is ultimately required—on the average about 0.01-in. less than the finished diameter; the expansion is usually about 0.003-in. to 0.005-in., the average diameter of the mandril being 1 in. After hardening, the milling cuters are first chucked truly with the outside diameter in a self-centring chuck, and the internal bore is ground up truly to the finished diameter. After this the hardened cutters are chucked upon mandrils and the teeth are finished upon the special machines to be described.

Forming Cutter Teeth.

Accuracy of form of the cutters is secured, both when being cut in the first place and also subsequently reformed by turning the blanks and milling out the teeth in the ordinary manner, and then backing them off in the machine shown in Figs. 4 to 7. In this machine the cutter to be formed is carried on a dividing head, so that one tooth at a time can be presented to the small milling cutter a, Fig. 4. This is mounted upon the cutter spindle b driven by a pulley c, from which cat-gut cord runs through on overhead gear, allowing the spindle to be moved within the necessary limits. The small cutter spindle-frame forms part of a system of adjustable pantograph links, so that its movement is an exact reproduction in miniature of the movement of the tracing pin upon the former d fixed in front of the machine. The operator, by means of the handle e, moves the pin f lightly along the former, and consequently also moves the cutter over the tops of the teeth to a similar but smaller shape. The small cutter is enlarged in diameter towards one end, so that it cuts away the back of each tooth upon the cutter to the necessary extent. Commonly a conical backing-off cutter is used, the angle of the cone being 20 degrees and the setting being such as to give an ang'e of relief of 10 degrees, that is, the axis of the cone is at right angles to the radial face of the tooth being backed off. It will be seen that this characteristic enables the machine to produce teeth of any form, upon a cutter backed off in every direction from the cutting edge, so that a clean cut can be taken with the sides as well as with the tops of the teeth.

In the case of those milling cutters in which grinding back the faces of the teeth so backed off might cause serious inaccuracy, owing to its throwing back

the radial cutting edges of the teeth, the cutters are built up of annular sections which are either clutched together or clamped together upon plain faces, from which, after a particular grinding or series of grinding operations, the same amount is ground off as that by which the radial cutting edge has receded. Where the edges of the teeth are parallel or nearly parallel to the axis of the cutter, the profile is, of course, not appreciably affected by grinding back the faces of the teeth. A further means of avoiding such errors is also to be found in grinding the tops of the teeth in the manner subsequently described.

As it is found advantageous, in order to obtain a fine finish, to use helical teeth upon milling cutters, a fitting consisting of a sleeve with spiral slot (See Figs. 6 and 7) can be mounted on the same spindle as the milling cutter. A pin on a hinged arm centred above the backing-off cutter spindle is arranged to slide in the slot in this sleeve so that, as the frame carrying the copy and the cutter spindle is moved backwards and forwards along the axis of the cutter being backed off, the helical teeth are maintained in correct relation to the backing-off cutter; while at the same time they are backed off to the correct profile. Theoretically, of course, in such cases the axis of the cutter being operated upon could be inclined to the axis of the backing-off cutter spindle at an angle equal to that of the spiral of the cutter being produced, but in actual practice it is found that this adjustment is very seldom necessary, as the cone angle of the backing-off cutter, and also the amount of material which can be removed from the cutting edge of the cutter being produced, are both, comparatively speaking, small.

This machine has thus been found not only capable of backing off satisfactorily cutters of a shape which could not be backed off along the whole length of their profile in an ordinary relieving lathe in one operation, but it has been found possib'e to do the backing-off in, approximately, one-third of the time required on a relieving lathe, and the finish of the teeth is found to be better.

Grinding Cutters.

Figs. 8 and 9, show the machine used for sharpening the cutting edges of the hardest milling cutters and subsequently regrinding their faces or edges as required from time to time.

This machine has a grinding wheel mounted upon a spindle suspended on a swinging frame and follows the work by the use of a former, the profile of which is of the same magnitude as the one to be ground. In an ordinary way this former would not have the exact outline of the shape desired on the finished cutter, corrections having to be applied for the diameters of the tracing roller and also of the grinding wheel, the latter item being, of course, itself variable. This difficulty is overcome by using grinding wheels of special fast-cutting artificial stone which will perform a considerable amount of useful work before being appreciably reduced in diameter, and by making the diameter of the tracing roller equal to the diameter of the grinding wheel; there is in addition, of course, an adjustment for raising or lowering the former.

The milling cutter being ground is, as before, mounted upon a dividing head in the case of straight cutters, or upon a dividing head provided with helical sleeve in addition in the case of helical teeth cutters, and all the teeth are first ground along the tops to profile and afterwards in the usual manner down their faces, the grinding wheel being, of course, set over to the angle of the spiral. The cutter thus finished has edges both of the maximum keenness and also of the maximum endurance due to correctly hardened high-speed steel, as only the thin skin partially oxidized in heating before hardening is removed.

Hitherto the apparatus employed upon sharpening profile cutters for milling machines in repetition work, such as is produced in small arms factories and elsewhere, has required the handling and attention of men with considerable training and skill, liable to error and consequently well paid to avoid it. The provision of simple machines such as those described now enables a mechanic to regrind correctly all cutters brought to him with considerable rapidity and the minimum possibility of error. By standardization of the pitches of the teeth and their angles, and by the provision of suitable templates for each of the cutters commonly required, the use of these machines has been found to result in distinct economy, both in the upkeep of cutters and also in the quality of the work turned out.

Considerable advantages result from being able to reform accurately the contour of the teeth in addition to grinding the face. In ordinary use the teeth of milling cutters are damaged not only on the face, but to an even greater extent on the top, and it has frequently been found that removing, say, 0.002 in. from the top has as beneficial an effect as removing 0.006 inch. from the face, and with this additional advantage that, when a tooth has been ground to its fullest extent from the face, it can be further sharpened on the top whilst still retaining its correct figure, until the tooth is too short through not allowing the necessary c'earance; and this consideration will in many cases lengthen the life of a cutter by 10 per cent.

The life of some milling cutters prepared by the methods indicated above has been extraordinary; for example, a cutter working in a self-acting cross milling machine and operating upon the bodies of the service rifle at an average cutting speed of 69 feet per minute, with a feed of 1¾ inches per minute and a depth of 0.08 inch, and taking a cut of an average width of 1-11-16 inch and ⅞ inch long, has produced, at the time of writing, 39,170 bodies and is still good for about half as many more. This particular cutter has been reground across its face twenty-five times. The composition of the steel upon which it operates is 0.5 to 0.6 carbon with an ultimate tensile strength of not less than 35 tons per square inch.

NEW HIGH SPEED TOOL STEEL.

A great deal has been said and written recently regarding the new high speed steel that is now being placed on the market; and the manufacturers of tool steel have been of late commanding the attention of the steel using world in their endeavor to produce an even more superior article than that which is in use at the present day.

Messrs. Walter Spencer & Co., of Sheffield, Eng., have been conducting exhaustive experiments for a considerable time with a view of producing a superior article to that which is known to the consumers; and they have now announced that they are able to p'ace on the market a "water hardening" high speed steel which gives excellent results. This brings it into universal use, as the smallest possible works can use the water hardening steel. The new steel will keep its cutting edge for a long period and take a very heavy cut.

High speed drills have also been commanding the attention of Messrs. Walter Spencer & Co., and they are now manufacturing a high speed drill that is made from special registered section steel. These drills have a long life, and do very rapid work.

K. M. Trigge, who for many years has been a traveler for the Allith Mfg. Co., Hamilton, covering eastern territory, has made a change. He has joined the selling staff of the Reddaway Belting Co. and will cover the States of Vermont, New Hampshire and Maine as well as the Asbestos districts of Quebec province and the Maritime Provinces. Mr. Trigge will be familiar with this trade having been with the Reddaway company for years formerly. He made many friends in his own field and no doubt will prove an acquisition to his old firm.

Ralph P. Bell, formerly of Halifax, is in charge of the Canadian Fairbanks Company's business between Winnipeg and the coast. Mr. Bell is a member of a well known Halifax family. He graduated from Mount Allison University in 1907.

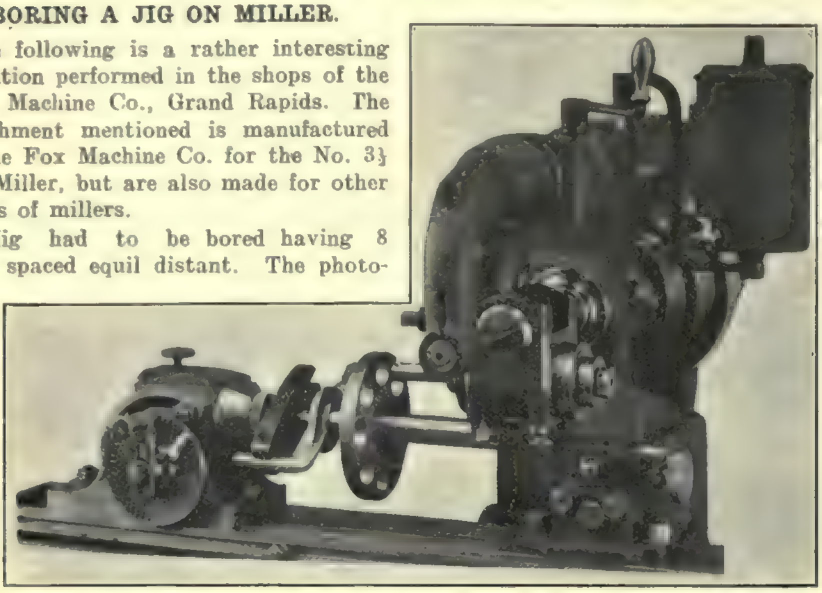
MACHINE SHOP METHODS AND DEVICES

Unique Ways of Doing Things in the Machine Shop. Readers' Opinions Concerning Shop Practice. Data for Machinists. Contributions paid for.

BORING A JIG ON MILLER.

The following is a rather interesting operation performed in the shops of the Fox Machine Co., Grand Rapids. The attachment mentioned is manufactured by the Fox Machine Co. for the No. 3½ Fox Miller, but are also made for other makes of millers.

A jig had to be bored having 8 holes spaced equil distant. The photograph shows how the job was done on a No. 3½ Fox Miller with universal dividing head and vertical attachment. The plate to be bored is mounted on a mandrel supported by universal dividing head and tail stock on the top of the milling machine. The vertical attachment which may be swung from vertical to horizontal or any intermediate position was adjusted to horizontal position and in it was mounted a short boring bar. This arrangement enables the regular table feed to be used and the plate to be indexed for the different holes thus rendering a quick operation and a very accurate jig, as the error in spacing was found to average not aver .0005.



An Interesting Operation on Miller—Fox Machine Co.

A TURNING JOB.

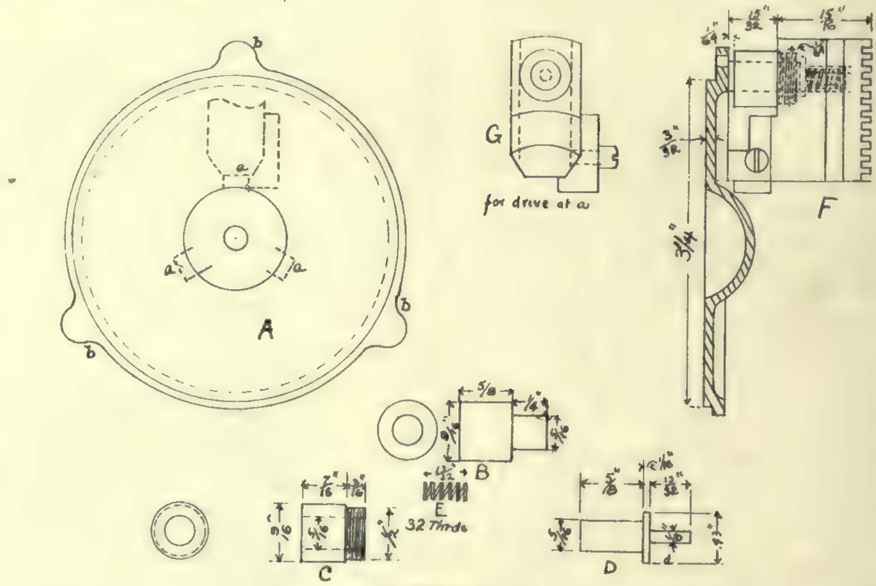
By S. A. Francis.

A job came into the shop not long ago for a large number of brass composition plates such as is shown at (A) in the sketch which required facing off as well as turn stepping them. While the job looks like a simple one some difficulties are encountered which one would not look for at first glance.

The manner in which the various difficulties were overcome may be of interest and service to your readers, as similar jobs, or substantially similar, are by no means rare.

First a driver was put on one of the jaws of a three jawed gear universal chuck, shown at (G). Due to the thinness of the plates they would chatter and spring, so a 5-16 inch hole was drilled in the face to step off the three jaws, and pressed in the stud (B) allowing the lugs (b) to rest on the stud. This was found very effective while the chuck was new and unworn, but after continued use and it was affected by wear, the plates tipped so that the lugs did not rest on the studs as designed, thereby causing the same trouble of spring and chatter as was experienced.

The bushing shown at (C) the spring (E) and the stud were therefore made, and the jaws drilled and tapped as shown at sketch (F). Stud (D) was made a nice sliding fit in the bushing (C) hole. The spring (E) was then placed on the stud shown at small (d) and allowed to rest on bottom of drilled hole in jaws, forcing the stud (D) outwards. After assembling the parts and passing the plate in so as to have the lugs (b) rest on bushing (C) it was found that when the jaws were tightened that the spring (E), when made of proper tension in order not to spring the plate, held the stud (D) against the lugs (b) with sufficient force to avoid all chatter and spring due to the worn jaws tipping.

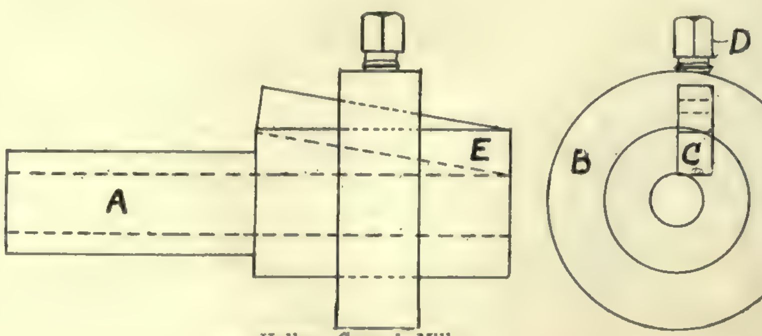


A Turning Job.

A GOOD HOLLOW MILL.

By B. L. Hamilton.

The writer has had quite a lot to do with hollow mills and often found them troublesome, for when the clearance wore



Hollow Ground Mill.

off they would bind on their work. Probably other men have had the same trouble too, therefore I am submitting this sketch of a mill that has proved most satisfactory both for drill press and turret lathe.

A is a piece of tool steel ⅞ inch. diameter and 3 in. long, turned down to ⅝ in. diam. x 1½ in. at one end. A ⅜ in. hole is drilled through the entire length and a groove is milled in one side of same as shown at E, in which is held a piece of 5-16 in. square tool steel. This serves as a cutter being held in place by collar B and setscrew D.

CUTTING SPEED OF TOOLS.

By J. H. R. Hamilton.

Often when a man is working on a machine tool he is wondering whether his tools are working at their proper speeds, and doing their maximum amount of work.

The older mechanic can tell from past experience whether he is getting out of a tool all there is in it, but sometimes a foreman will come along and tell a new man to "speed her up," knowing that from previous trials the tool is capable of doing more work. While it is true in some cases the foreman is trying out the new hand; in the majority of cases the new man is practically feeling his way and trying out the machine on which he is placed.

The idea of this article is to show that the placing of index plates similar to that shown in Fig 4 (each plate suited to the machine for which it is intended) would overcome this trouble to some extent, as the man could tell in in a few minutes with a piece of chalk or pencil whether he is working up near the limit or not. The index plate shown will show the idea of this article, but to give some of the younger readers the purpose for which it is intended the accompanying drawings will prove of some benefit.

Take the Lathe First.

Knowing the main shaft to be traveling (in this case) 150 rev. per minute. The speed of lathe spindle can be found by multiplying the number of revolutions of the main shaft by the diameters of all the driving pulleys in the series and dividing by the diameters of all the driven pulleys.

Take the drive shown in the sketch.

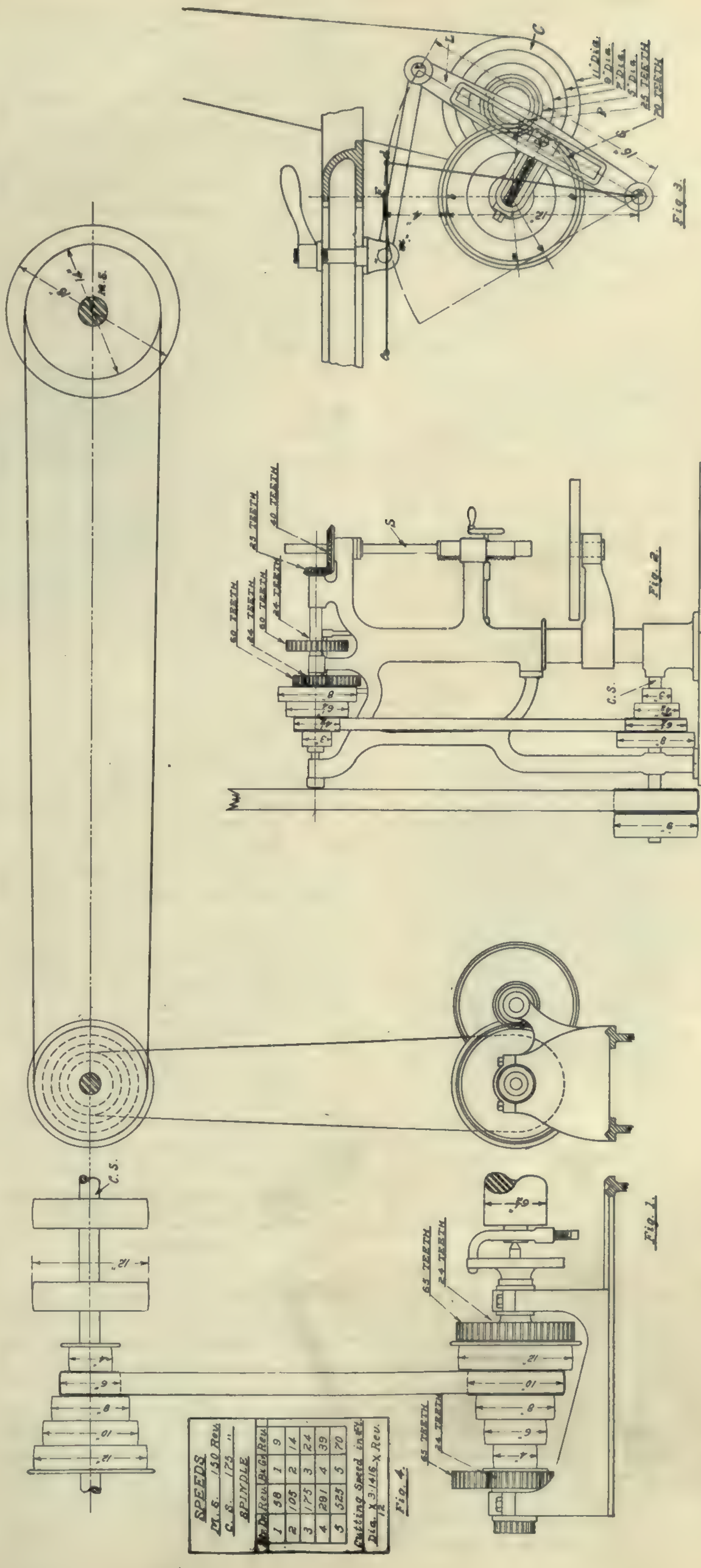
For straight drive.

By the formula:

$$\text{Rev. of spindle} = \frac{\text{Rev. of M.S.} \times \text{dia. of drivers}}{\text{dia. of driven}}$$

$$\frac{150 \times 14 \times 6}{12 \times 10}$$

105 r. p. m. of lathe spindle.



Cutting Speed of Tools.

With Back Gear.

Take number of teeth in gear instead of the diameter.

$$\text{Rev. of sp.} = \frac{150\times14\times6\times24\times24}{12\times10\times65\times65} = 14.3+$$

say 14 rev. per min. Cuttting speed in ft. per min. on shaft $6\frac{1}{2}$'' dia. with back gear=

$$\frac{\text{dia.}\times3.1416}{12}\times\text{No. rev.} =$$

$$\frac{6.5\times3.1416}{12}\times14 = 23.8 \text{ ft. per min.}$$

which is a pretty good average for cast or wrought iron.

With modern high speed steels the cutting speeds can be increased from 20 per cent. to 60 per cent. according to the grade and condition in which the tools are kept.

The different revolutions of the drill spindle are found in the same way.

Take the drive shown.

24'' pulley on the main shaft. Straight drive:—

$$\frac{150\times24\times6.25\times25}{9\times4.5\times40} = 347.2$$

or 347 rev. per min. of drill spindle.

With back gear:

$$\frac{150\times24\times6.25\times24\times24\times25}{9\times4.5\times60\times60\times40} = 55.5$$

or 55 r. p. m.

The positive cutting speed on a shaper or slotter is not so easily found as the cuting speed varies for every position of the stroke as will be seen by the sketch of the shaper action shown in Fig. 3.

When the link L is in the position shown the tool, ram and upper end Y of the link are practically stationary, but the action of the machine causes the reciprocating parts to gradually increase their speed until the link L is in a vertical position. Further movement causes the reciprocating parts to gradually decrease their speed until the link L is at the extreme left, when it is returned to its former position by a gradual increase and decrease of speed, but with a greater velocity according to the angle through which the block C travels.

The ratio of return to that of advance in the position shown or on a 16'' stroke is 2:1 as the angle of advance C B A is twice that of the angle of return A O C. But if the block C is moved toward the centre or to a position that will give a 4'' stroke (as that shown by the skeleton sketch) the ratio of return to that of advance will only be about 9:8, as the angle of action of link L has been greatly reduced.

As long as the belt is on the same step of the cone pulley, the number of strokes per minute will be the same whether it is a 1'' or 16'' stroke, but the cutting speed will be reduced in proportion to the length of stroke.

To find the maximum cutting speed, which will be when the link L is in a vertical position on in the middle of the stroke.

Find the number of revolutions of gear G in the same manner as the previous example.

Main shaft pulley 9'' dia.

Counter shaft pulley 18'' dia.

Cone pulleys same as on machine.

The four speeds are 12 rev., 21 rev., 34 rev. and 58 rev.

The maximum cutting speed of the tool is to the speed of the link block circle as the length of the link is to the distance of the link block C, from the fulcrum, when in a vertical position on the forward stroke.

Cutting speed (maximum) for 16'' stroke on slowest speed.

Speed of link block circle=

$$\frac{8\times3.1416}{12}\times12 = 25 \text{ nearly ft. per min.}$$

Max. cutting sp; sp. lk. blk. circle::16:12 or max. cutting speed=

$$= \frac{25\times16}{12} = 33\ 1\text{-}3 \text{ ft. per min}$$

Take a 2'' stroke on same speed.

$$\frac{1\times3.1416\times12}{12} = 3.1416 \text{ ft. per min. of link}$$

block circle.

$$\text{Then maximum speed} = \frac{16\times3.14}{8.5} = 5.9$$

or 6 ft. per min.

By changing belt to the highest speed the maximum cutting speed for 2'' stroke=

$$= \frac{6\times58}{12} = 29 \text{ ft. per min.}$$

where 58 is the rev. of gear G on the fastest speed and 12 is the rev. of gear G on the slowest speed.

GASOLINE ENGINE CYLINDER REPAIRED BY AUTOGENOUS WELDING.

By Frank C. Perkins.

The accompanying illustration, Fig 1 shows a cylinder of a two cycle engine which was damaged by the breaking of a connecting rod, allowing the piston to strike the top of the cylinder, the deflector on the piston punching a hole in the combustion chamber wall. The illustration, Fig. 2, shows the same cylinder from the outside after welding by the autogenous process.

The same sort of puncture of combustion chamber wall often occurs by the head of a broken valve or other foreign object getting between the cylinder head and piston. This class of breakage is the most difficult to repair, as it is nec-

Fig. 1.—Broken Cylinder

essary in most cases to cut out a section of the water jacket to be able to work on the inner wall. the only deviation oc-

Fig. 2.—Repaired Cylinder.

curing when the break happens to be opposite a large hand hole.

The illustration, Fig. 3, a double cylinder is noted at the left, which was dam-

aged and repaired by this welding process, the broken parts being seen at the bottom, and the repaired cylinders at the right.

The illustration, Fig. 4, shows an air cooled cylinder, which was welded perfectly by the oxy-acetylene process and made practically as good as new.

It is held that breakage in automobile cylinders can be divided into three main classes which cover at east ninty per cent. of the cases, and most of these breakages can be satisfactorily repaired by means of the oxy-acetylene flame when proper utilized. The Davis-Bournonville apparatus is constructed for autogenous welding, which consists of fusing the metal around the break by means of an acetylene flame. The heat is concentrated to a very small area of being burnt with pure oxygen in a torch giving a flame temperature of over six thousand degrees, additional metal being added where necessary from a rod of the same material. This is practically recasting the part locally.

There is no doubt that autogenous welding is proving a great boon to those who are unfortunate enough to have their cylinders broken, as they can be satisfactorily welded up in the majority of cases, and with a little trimming off, will not show. In fact some people require this as they wish to sell their cars without the fact of the repair having been made, being noticed.

It is well known that broken flanges are a great source of annoyance. A portion of the flange, which holds the cylinder to the crank case is broken away, either due to their being insufficient metal to withstand the strain or to carelessness in assembling. It may be mentioned that these breakages occur in two ways, the wall of the cylinder may be broken away or part of the flange may be cracked off. In the latter case it is said to be an easy matter to make the repair but when the break runs through into the bore of the cylinder considerable care is required. It being first necessary to consider whether it is desirable to weld in the bore which would then require machining, or at any rate filing out, or only groove and weld from the outside to within a sixteenth of an inch of the face, sufficient metal being added to the outside to insure ample strength. This, of course, leaves the crack on the inside which can, however, be smoothed down, and is not objectionable for a repair job, not interfering with the satisfactory operation of the motor in any way.

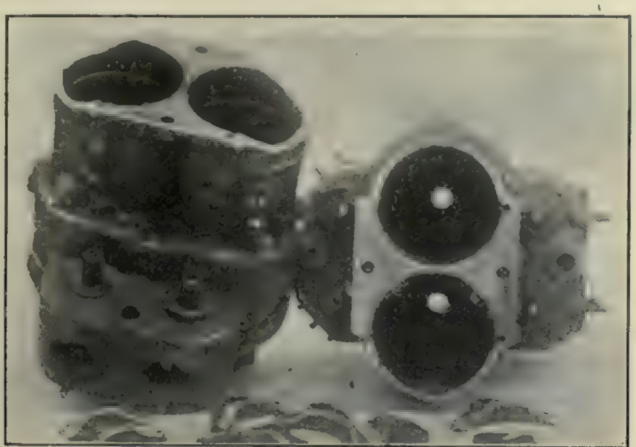


Fig. 3.—Broken Pan of Cylinders.

The next class of breakages, in order of frequency of occurrence, are those in which the wall of the cylinder, combustion or valve chamber is broken or cracked. These are in most cases due to freezing, but a certain number of them occur due to the designer making a flat surface too large without adequate ribbing to support the intermittent pressure of the explosion.

Many water jackets are broken by freezing and this is said to be the largest class of cylinder breakages, mainly due to carelessness in allowing the water jacket to get frozen up, resulting in the breaking of the water jacket wall. This is not always termed carelessness, as water jackets have been cracked as early as the middle of October when the owner had no thought of such a thing being possible.

It is also true that engine cylinder jackets have been frozen, due to too small drain cocks, and it is quite frequently the case that when shipping a car by rail in winter the drain cock will be opened, but due to some pocket in the water system, in some cases very small ones, which did not drain the cylinders, have been broken.

It is stated by engineers of the autogenous welding process who have had experience with broken cylinders, that curiously enough, the majority of cylinders cast from the same patterns will break in just the same place when frozen up. In a number of cases the break causes a piece of the wall of the water jacket to be entirely detached, and the breaks occur so near alike, in similar cylinders, that it would be possible to take the detached piece from one and weld it into another even the smaller irregularities coinciding.

In case a break of this nature is autogenously welded by means of the oxy-acetylene frame, the crack or edge of the broken part is prepared so as to leave a groove nearly through the metal. The whole part in then heated to about five hundred degrees, uniformly, this is not enough to warp the bore as has been repeatedly proven by careful measurements before and after treatment. The sides of the groove are fused together and filled from a rod of cast iron, the resulting weld being very neat in appearance, not generally requiring any finishing and it is as strong as the original wall. And as a very small number of units have been added to the part,

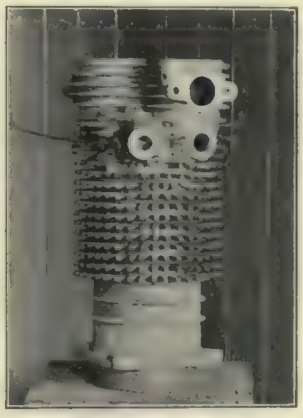


Fig. 4.—Cylinder Repair.

owing to the intense heat of the flame fusing the metal before the heat has time to spread, there is seldom any trouble with cracks when the metal contracts in colling.

Frank Barber, County Engineer for York, and C. R. Young, B.A.Sc., Lecturer in Applied Mechanics at Toronto University, and for three years connected with the structural departments of the Dominion Bridge Company, and Canada Foundry, have entered into partnership as consulting and designing engineers on steel and concrete bridges and general engineering. Their address is 57 Adelaide Street East, Toronto, Ont.

DEVELOPMENTS IN MACHINERY

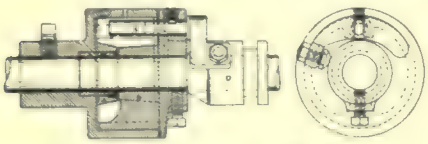
New Machinery for Machine Shop, Foundry, Pattern Shop, Planing Mill; New Engines, Boilers, Electrical Machinery, Transmission Devices.

NEW LIGHT POWER CLUTCH.

The accompanying illustration shows a small power clutch. It is designed for use on counter shafts, gas engines, or any machines which have to be put on and off often. It has been designed to run at very high speeds; this makes it a satisfactory clutch for this class of work.

It can be used with a pully and sleeve or used as a cut off coupling parts, and there is only one place of adjustment which makes it easily and quickly adjusted.

It is made in eight different sizes, ranging from ½ horse to 7 horse power.



"Ideal" Hub Clutch.

To operate this clutch push the sliding collar (D) along the shaft by an ordinary clutch shifter till it touches the hub (D). As it slides along the shaft its taper sides press lever (C) outwards, this acts on the oval end of lever (C) which is in between the lips on spring (B). The action of the oval on lever (C) forces spring (B) outwards against hub (A). When used as a cut-off coupling; or sleeve when used as a clutch, the spring (B) and hub (B) are cast in one piece.

The clutch is mandfactured by the Ideal Clutch Co., 16 Pearl St., Toronto.

PARAGON TAPER SHANK DRILLS AND SOCKETS.

The drill, Fig. 1, is twisted from flat stock, with a shank forged and

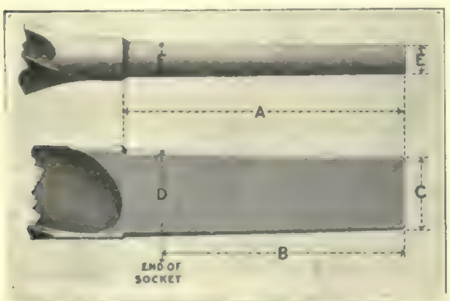


Fig. 1.—Paragon Taper Shank.

ground to size from the original bar, without weld or joint. This shank has a uniform taper on the flat sides as well as on the rounded edges.

The attractive feature of the shank, Fig. 2, lies in its strength and simplicity. It is the natural, logical method of driving a flat twisted drill. A regular taper shank sleeve outside, with

Fig. 2.—Paragon Taper Socket.

a flat tapered hole inside to correspond to the shank, is all that is required to hold the drill. A good true fit is thus secured, resulting in a firm accurate drive, with the strain distributed over the entire length of the shank.

The sockets are finished in either rough, fitted or sleeve styles. The Paragon taper shank high speed drills and sockets are manufactured by the Cleveland Twist Drill Co., Cleveland.

DOUBLE THREADED SCREW.

The Caldwell patent screw has two threads, one of which is half a turn behind the other, advance along the blank twice as quickly as the single spiral of the old type. These two threads are continued beyond the core of the blank, forming two chisel lips. These two lips are diametrically opposite each other, and are of such shape that the under side will clear itself as the screw enters the wood, the upper side being bevelled to raise the fibres when cut by the sharp edge and permit an easy entrance for the core. This shape continues throughout the length of the thread.

The following advantages are claimed for this type of screw:

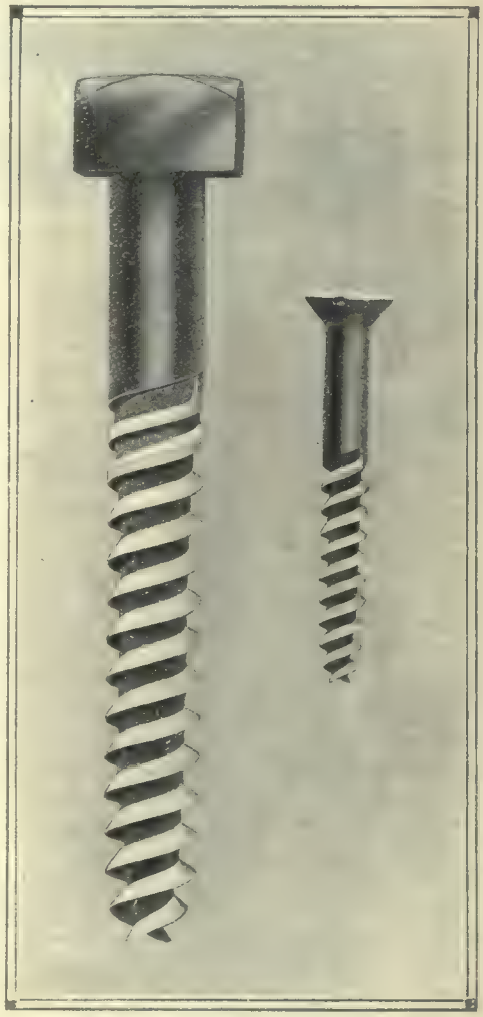
(a) The two projecting lips will take an instantaneous grip on the fibres of the wood, and even in hardwood the screw can be put in without the usual preliminary boring.

(b) With surprising ease the screw will cut its own way, the bevel side lifting the fibres and the undercut side free of all friction or hindrance.

(c) The double thread is so fast that less than one-half the time is required to put in or take out a given size.

(d) Although it gains so much in time, it loses nothing in holding power and vibration or shock will not loosen it as easily. The reason for these facts is that the fibres are not broken and chewed up by the screw in entering, but are split in one direction only and wedged tightly against that face of the thread, which must take the burden of the work the screw is called upon to do.

(e) The threads being opposed to each other give the screw a certain balance, and it will go in a straight line even across holes, cracks and knots.



Caldwell Patent Log Screw and Wood Screw.

These screws are made on specially designed automatic machinery. The lag screws are used in bridge work, railroad, telephone, telegraph work, machine shops, etc. The thread is used on hooks, etc., and can be easily screwed in by hand.

The screws are manufactured by the Anchor Screw Co., Toronto.

A 3-FT. RADIAL DRILL.

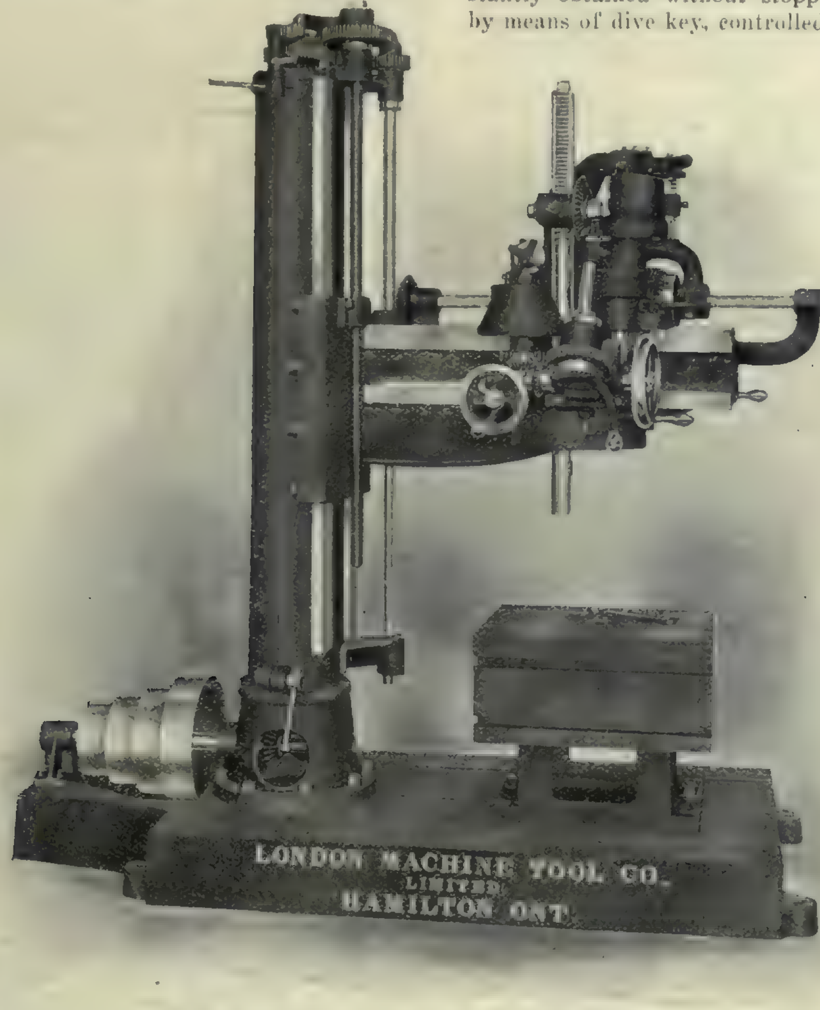
This drill marks an advance made in high-speed high-powered drills. The column is of the double type, having an inner column bolted to base and running clear through to the top of column. The outer column, which has a square sliding surface for an arm to slide on, revolves on inner column with large bearing surfaces. This system makes for rigidity and the square sliding face for accuracy.

The arm is of heavy box section with stiffness properly placed. The face of arm is very wide. The faces are neatly frosted and are accurately scraped. The rack on arm is of steel cut from the solid cold drawn bars; the rack being secured by ample screws and taper dowel pins. The arm is raised and lowered by power. It is not necessary to stop machine to raise and lower head.

The head is so designed that the driving gear on spindle is not placed on top, subjecting the whole of the spindle to very severe torsional and bending strains, but it is placed below head neatly enclosed in light joint gear case and at the closest point to the drill. By this system of construction the spindle is made very much larger, and torsion on spindle is reduced.

The spindle diameter at point of application of power is 2¼ in. This increase of diameter also means that the pressure on driving keys is very much reduced, making drill very much easier to feed under heavy cuts. The spindle is of crucible steel, accurately ground and is double keyed. Ball bearings in hardened steel thrust collar are designed to take up the thrust.

There are four changes of geared feed, .0078, .0135, .021 and .034 per revolution of the spindle. These feeds are instantly obtained without stopping drill by means of dive key, controlled by convenient lever. Feeds can be thrown in at any point.



New Radial Drill, London Machine Tool Co., Hamilton.

The tapping mechanism is carried on the head between the back gears and the cone or speed box, giving the friction always a high-running speed, even when the spindle is running at a slow rate of speed, hence making a very powerful drive. The frictions are of a very powerful inside band type, and the pressure is placed on same by small finger having great leverage.

The base is deep and is very heavily ribbed, with four ribs running the entire length and is provided with T-slots, for bolting work on table thereto.

The machine is provided with plain box table, having a top surface 18x22 in. and a side surface of 10x22 in. It is 18 in. high. Both top and side are made perfectly square and are provided with T-slots.

The machine is provided with two speed friction countershaft, having pulleys 12 in. diameter, for 4 in. belt, which should run at 185 and 250 r.p.m. These speeds give 16 changes from 20 to 360 r.p.m.

Diameter of spindle—2¼ in.

Feed of spindle—11½ in.

Maximum height of nose of spindle over base—54 in.

Minimum height of nose of spindle over base—24 in., spindle up.

Maximum swing of spindle diameter —6 ft. 1 in.

Traverse of head on arm—22 in.

Total height of drill, spindle up, 7 ft. 10 in.

Width of base—34 in.

Height of base—6½ in.

Weight of machine complete—3,600 lb.

It is manufactured by the London Machine Tool Co., Hamilton.

HOBBING MACHINE.

A machine has been designed by E. J. Lees, of the Lees-Bradner Company, Cleveland, O., for hobbing spur, spiral and worm gears and threading worms. Spur and spiral gears of not over fourteen inches in diameter and not over four diametral pitch, worm gears of the same diameter not over one inch circular pitch, and worms of one inch circular pitch and any lead, and not over eight inches long and eight inches diameter, all in steel, are rapidly and accurately handled.

The machine is back-geared eight to one, is driven by a three-step cone located midway between cutter and spindle mechanisms, and the larger the diameter of gear to be cut the closer the cutter is brought to the original point of power, and the screws used for feed and head slides both operate with a draw pull and not a push.

The swivel head which has a swing of 180 degrees is of original design and has no over-hang, the swivelling mechanism consisting of one pair of bevel gears inside of a large cylindrical head which in turn fits in another cylindrical bearing on a slide, the two being rigidly locked together by bolts at either end, no balance weights being necessary and ample adjustment being provided for moving the hob on the cutter longitudinally. Care has been taken that all movements are in one direction in all operations, which is of vital importance, as it eliminates back lash, and the ma-

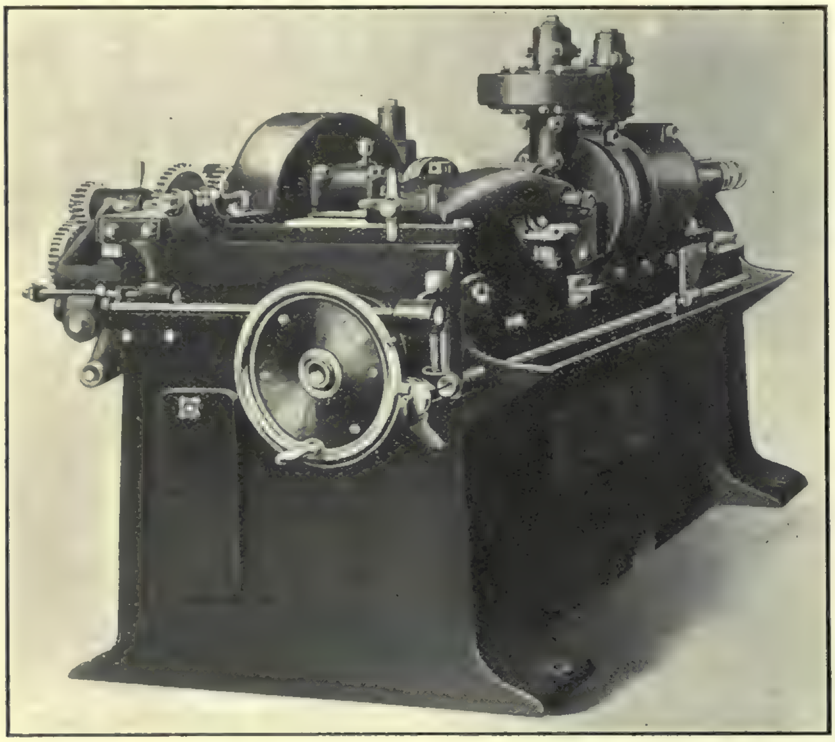
chine can handle a six-tooth seventy degree right angle spiral as readily as a gear of large number of teeth, this being accomplished by a compound indexing gear of two distinct ratios; and if an odd gear is needed and the necessary hob is not available, a single cutter can be used.

The work spindle and arbor are horizontal and the arbor is rigidly supported at both ends, which is of vital importance, especially in hobbing a spiral gear, and owing to the design the work is held close to rotating mechanism, and as the spindle has a very accurate independent rotary adjustment a re-location for tooth to cutter can be made.

In order to have a micrometer easily adjusted and readily operated for duplicate work without having to watch the graduations after a setting is made, one is provided with the graduations on a disc six inches diameter, which is locked with a thumb screw at zero when starting to take the reading. The setting for the depth of the cut is taken and a stop rod collar is adjusted, the original feature of this mechanism being that the slide can now be backed away to any distance and then returned to its original setting to a positive stop without attention to the graduations, although should the operator wish to set the cutter in or out a few more thousandths the original reading is visible and can be worked from.

As every worm gear necessarily requires a worm the ability of this machine to thread a worm will be of interest. For this a single cutter is used, which runs from seventy-five to one hundred and seventeen revolutions per minute, the worm being rotated with the necessary lead. As the cutter head is very rigid this eliminates the posibility of thin and thick threads. The worm is rotated by change gearing, ample provision being made for correct rotation to suit large and small diameters of work, the depth of thread being obtained in the same manner as in cutting a gear. The worm can be mounted on a shank arbor or on one or two centres or held with a draw-in collett with either bush or centre at the other end.

All the mechanism is in one horizontal plane and every part can be readily reached, adjustments being provided especially for the rotating worm and gear to positively take up any back lash.



Machine for Hobbing Spur, Spiral and Worm Gears, and Threading Worms.

The chips are readily disposed of without coming in contact with any moving part and are removed by taking out a pan located directly back of the door in the machine, this chip pan and the receptacle for oil being the only parts inside the machine—the pump being located outside and below the oil supply, which obviates the priming of the pump.

As the work spindle has a three-inch bore, gears on a shaft can be either held in the spindle with a draw-in collett, or can be held on one or two centres. In operating the machine the necessary change gears are placed to suit the work to be cut. The necessary depth is obtained by adjusting the head, at which time the micrometer is set and the work is fed across the cutter head. At the completion of the cut the main drive is automatically tripped and all mechanisms stop in unison, which is necessary in cutting a spiral gear, and relieves the operator of constantly watching the work and having to stop the machine.

DRILLING MACHINE FOR HOBBING TAPS

We illustrate herewith a new type of drill press especially designed for the use of manufacturers of taps. The tap blank is inserted in the end of the vertical spindle, as the tap itself would be in the case of a drill press used for tapping, and is then driven through a die bolted to the table beneath. In actual use, two dies are employed in succession, one a roughing die and the other a finishing die.

While the machine resembles, in many respects, an ordinary drill press, it differs notably in that the automatic feed is secured by means of a lead screw on the top end of the spindle, which is extended through the crown gear for that purpose. The upper end of the spindle is turned down to a smaller diameter than the remainder and a threaded sleeve, serving as the lead screw, is fastened upon it by means of a locknut, this removable sleeve having the same lead as the tap which is to be threaded.

When the tap blank has been driven through the die, it drops out and at the same moment an adjustab'e tripping dog clamped on and revolving with the threaded sleeve throws out of mesh the nut which engages the sleeve, whereupon the spindle is returned automatically, by a counter balance weight, to its original position and is ready to be supplied with another blank. The downward feed is thrown in again by means of the hand lever at the side of the lower spindle bearing.

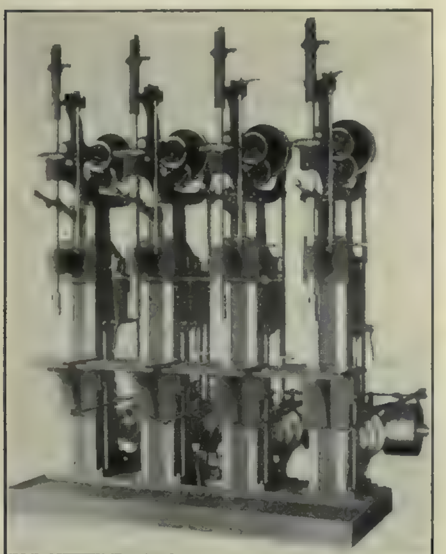
The lower end of the spindle is fitted with a spindle head and having the usual Morse taper and a special fixture for holding the square head of the tap blank. This spindle head is of further interest because of the special method employed for slotting it. The slots in the spindle head are milled out on a special machine having two milling cutters forking from both sides at once. This results in an accurate and smoothly finished slot.

The machine has four spindles and therefore provides for two sets of dies. Each of the spindles is attached to an independent column and is equipped with its own independent driving mechanism, although all four columns are bolted to a common base plate.

Inasmuch as hobbing tap blanks does

not require a high speed, the back gears are designed to be left permanently in mesh, changes of speed being made by shifting the belts on the cone pulleys. Each lower cone pulley is driven at right angles from a shaft bearing a tight and loose pulley, and hence any spindle can be stoped independently of the others by means of the belt-shifting levers projecting through under the tables. Each table can also be lowered or raised independently of the others by means of a screw passing through a nut attached to the table and provided at its upper end with a bevel gear drive and crank.

The columns supporting the spindle heads and driving mechanism are of the box type and very substantial. The upper head is fitted with an additional back brace supporting the outter end of the coned pulley shaft, for rigidity. One oil pump supplies oil to the four spindles, and drainage from the tables



Drilling Machine Specially Designed for Hobbing Taps.

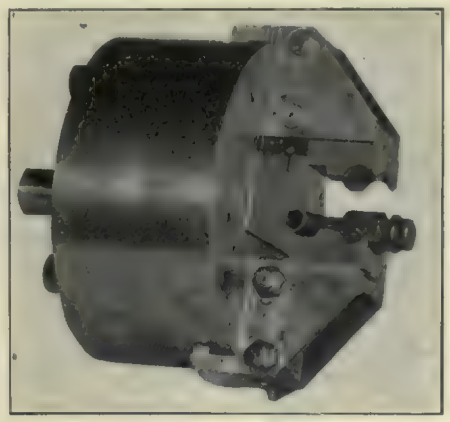
returns to the oil pan base, so that the oil can be used over and over.

This machine has been designed by the Hoefer Mfg. Co., Freeport, Ill.

NEW QUICK ACTION UNIVERSAL CHUCK.

At the recent Foundrymen's Convention in Cincinnati, the Manufacturers' Equipment Co., North Jefferson Street, Chicago, had on exhibition their new two-jaw Universal aero-chuck.

As the name implies, this chuck is operated by compressed air, and was designed with a view of producing a chuck with all the advantages of the older box chuck, with the added features of being opened and closed rapidly without the aid of a wrench or key. The chuck was primarily designed for brass work, but has been used in iron and steel work with satisfaction, as the construction gives great holding power. There is no necessity of making new false jaws when instaling this chuck, as the design will accommodate any false jaws that may be on hand.



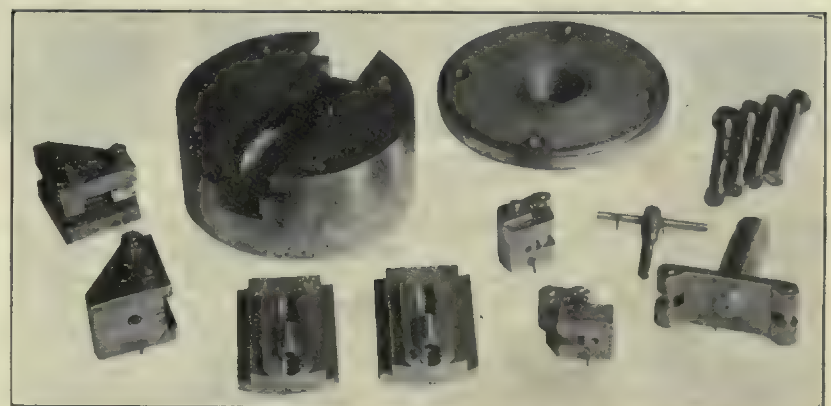
Quick Action Chuck.

The jaw-plates, which carry the master jaws, are operated upon by toggle joints so placed to exert the greatest pressure when the jaws are closed or nearly so. This arrangement will adjust itself to any variation that may occur in the castings. The advantage of using air is that there will always be a constant pressure on the piston, insuring flexibility of use. When using air, there is no more consumed than that which is necessary to fill the cylinder and this has to be provided whether the air is used constantly or shut off after each chucking operation. Where air is not available, this chuck can be operated with a hand lever.

One of the features of the chuck is the wide range of adjustment of the master jaws, and the fact that any false jaws can be accommodated within the limits of the chuck. The jaw-plates have a transverse movement of ¾-inch each, or a full opening of 1½ inches. The master jaws are adjusted by short screws fitted into recesses at the back. The jaws are locked by clamping bolts when in the desired position.

This aero-chuck is made in the three following sizes:

	No. 0 inch	No. 1 inch	No. 2 inch
Capacity	2	4	6
Dis. jaws project	2½	3	3½
Largest outside dia. ..	7	9	12
Length of chuck	7¼	8¼	8¾
	lbs.	lbs.	lbs.
Approximate weight ..	27	45	60



Details of Quick Action Chuck.

Many hospitals in England are provided with a special apparatus for extracting iron and steel fragments from the eye by means of powerful electro magnets. The magnet employed has a core three feet long and six inches in diameter of the best Swedish soft iron. Two hundred pounds of insulated wire are wound in two coils about the core. The end of the magnet is threaded to receive terminals of different shapes to suit various conditions. The magnet is mounted on ball bearings and can be moved in any direction. The strength of the magnetic field may be varied at will by means of a rheostat. When used at its maximum power, the magnet exerts a pull of 30 pounds per square inch at a distance of an inch. A special type of apparatus is provided for reclining patients. In this case the magnet is mounted on trunnions, and is tilted by means of suitable gearing operated by a hand crank.—Scientific American.

Walter R. Duckworth, who for the last twelve years was chief inspector for the Dominion Bridge Co., at their Lachine Works, has opened an office in the Eastern Townships Bank Building, Montreal. The business carried on will be the inspection of bridge and structural work, materials of construction, reports and valuations..

POWER GENERATION AND APPLICATION

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Difficulties Overcome by Hydraulic Elevator

The Problem of Transportation Across the River St. Lawrence at Quebec Solved by an Hydraulic Elevator to Overcome Tides

By J. PARKIN

Among the many interesting problems that have been solved during the past year, special notice might be taken to the car ferry which has commenced regular traffic across the St. Lawrence River from Quebec to Levis and Point Levis. The object of the ferry is to transfer loaded freight cars from one side of the river to the other and in order to do this, many difficulties presented themselves to the promoters of the scheme, but all these difficulties have been over come.

Shortly after the fall of the Quebec bridge, the idea was conceived by the Directors of the Quebec and Levis Ferry Co., that it would possibly be practicable to convey loaded freight cars from one side of the river to the other and thus fulfill in a great measure the object for which the Quebec bridge was being built.

One of the great difficulties which was encountered in the first place, was the purchase of a boat, as to build and construct a boat suitable for this work would have taken very much longer than the Directors cared to wait, and it was deemed advisable to get the ferry into commission as quickly as possible, as no one but those who ship freight to Quebec and points east are better able to testify to the advantages that such a ferry would be. We might say that, at the present time, all through freight that is shipped via Grand Trunk, is unloaded at Point Levis onto boats and lighted across the river and re-loaded; so an immense amount of work and time would thereby be saved by getting the ferry into immediate commission.

A boat was purchased from Ogdensburg which filled the requirements of the Ferry Company on account of its length and its width being 40 feet beam and some 300 feet in length, and having a hold below the deck some 15 or 16 feet deep.

The next proposition which confronted the Directors of the Company was, what were the best means of getting the cars on and off the ferry, on account of the unusual high rise and fall of the tide, the rise and fall every day varying from 12 to 18 feet. It will readily be seen then that it was an utter impossibility to make use of the ferry under these conditions without some appliances being placed on the boat for raising and lowering the cars.

It might be suggested however, that a long slip might have been provided, which would have floated in the water and to the same level as the ferry, but when we take into consideration that the ferry company have six different landing places, what an enormous cost the building of these slips would have been for a private corporation to undertake.

A disadvantage presented itself in connection with the slips, as the land was not procurable for providing such slips, as they would have had to have been of extreme length and the grade would have been such as to have made it dangerous to have allowed loaded cars to run down these slips to the boat.

A huge crane was suggested, which would pick the cars up bodily and place them on the deck of the ferry, but this would have necessitated a crane at each landing place, which would have also been an expensive proposition, and would not have been convenient, as the directors intended using the ferry during the winter and, they were of the opinion that cranes and metals exposed to weather, such as these would have been exposed to, would have been practically useless during the severe winter months, both on account of the extreme cold and on account of the unreliability of metals such as chain, etc., in extreme cold weather.

Fig. 1.—Elevator Car.

Fig. 2.—Taking on a Car.

It was then thought that possibly the cars could have been run onto the boat from the fore part of the boat, by having a dock provided so that the boat could run its bow right to the dock and take the cars on in the fore part of the boat. This was also impracticable for the reason that docks would have had to have been built at the different landing places to allow the full length of the boat to go into, to be clear of the strong current that is constantly running either up or down the St. Lawrence, when the tide is coming in or going out. It would have been absolutely impossible to have

made the boat secure to the different landing points, as the stern of the boat would have been 300 ft. out into the river, while the bow would have been touching and made fast to the dock.

Still another idea was considered, that even although the cars could have been brought on at the bow, it would have required an elevator in the bow of the boat to take the cars on and lower them to the deck and visa versa when the ferry reached the other side, to raise cars to the height of the deck. The difficulty that presented itself in this case was that only one line of tracks could have been put on the boat.

Install an Elevator.

It was arranged then to install a powerful elevator, which would be raised up to the height of the dock when the tide was out and the cars put on the elevator and lowered to the deck, and when the ferry had its full load of cars, they would be crossed to the other side of the

Fig. 3.—Row of Steel Rails.

river and placed on elevator one by one, and raised up to the height of the dock and pulled off the ferry.

Then the capacity of the elevator had to be considered on account of the extremely heavy loads now hauled by the railway companies in steel gondola cars and the latest of the G.T.P. cars, which are longer and very much heavier than the ordinary style of freight cars. It was therefore decided that an elevator to adequately handle the loads should be of 120 tons capacity, and that it should be operated by hydraulic pressure, as there would be ample steam power on the ferry to run the necessary steam pumps.

The contract for the elevator of this capacity was given to the Parkin Elevator Co., Hespeler, Ont.

Description of Instalation.

The elevator is what is known as the "Hydraulic Plunger Type," and consists of six cylinders, 21" in diameter and 15' in length, all below the deck, and the tops of these cylinders are fitted with stuffing glands capable of receiving 10 rings of best hydraulic packing. The walls of cylinders are 2" thick, and 3' from the bottom of the cylinder, a wide flange was cast onto same, extending out from cylinder a distance of 12" on each side. This was done in order to distribute the weight so as to prevent all the weight being carried by the cylinders standing on the bottom or bilge of the boat. A concrete foundation 40 feet long and 4 feet deep was placed on the bilge of the boat, and all the cylinders were set into this concrete base.

It might be worth while pointing out here that the cylinders had to be plumb with the upright supports on the boat, as it was impossible at any time to use a plumb line for setting the cylinders, as the boat listed from one side to the other at different intervals; the same applies to the setting of the cylinders to correspond with the angle of the boat fore and aft; by this we mean that the stern of the boat was very much lower in the water on account of her heavy engines being placed there, so that the elevator had to be set plumb fore and aft, irrespective of the slope of the deck. The elevator car, proper, which is shown in Fig. 1. is 40 feet long and consists of two, 24" x 24" I beams, 40 feet long, and the heaviest rolled by the Carnegie Steel Co. These two beams weigh in the neighborhood of three tons each. Immediately below the platform will be seen the six plungers, two in the centre and two at each end, which do the lifting. These are turned accurately, and are fitted to the elevator platform by means of 8" steel shafts. and it will also be noticed that the bearing at each end of the elevator platform has a slot hole in same, which admits of either end of the elevator being hoisted or lowered while one end may remain stationary. This provides for any listing that might be in the boat. The plungers of this elevator are 18½" in diameter and are made of cast iron reinforced with six 1¼ steel rods running through the entire length of same. These plungers weigh 3½ tons each.

Each battery of cylinder is operated by operating lever, and in order to raise or lower one end while the other end remains stationary, all the operator has to do is to open the lever controlling the centre battery of cylinder half way and one of the end batteries fully open and the elevator will incline to a distance of 5 feet in its total length of 40 feet.

The pressure used in each of the cylinders is 225 pounds to the square inch and is compressed by means of a steam pump, having a pumping capacity of 1000 gallons per minute. The water used is not wasted, but is discharged into a discharging tank and is pumped from the discharge tank into pressure tank and from pressure tank into elevator cylinders and the elevator is operated by this means.

On the elevator car, there is a steel truck with rails running lengthwise and crosswise. The car is drawn onto this steel truck. The elevator is then loaded and then by means of a steam winch placed fore and aft, the car is drawn along the deck of the ferry. The rails upon which these trucks travel are plainly shown in Fig. 1. Cars can be placed on either side of the elevator. These trucks are built altogether of steel, and weigh, approximately, six tons each.

Fig. 3 shows a row of these steel trucks on the deck of the ferry, and it will be noticed a piece of the rail is cut out. This being necessary for the flanges of the truck wheels to pass through

Fig. 4.—First Cars to Cross.

while the process of racking the buggies is going on. as it will readily be seen that these buggies have to be placed one on top of the other as the cars are taken off the boat, as there is no other way to dispose of them.

Fig. 3 shows one of the buggies standing on top of one of the lower buggies. This process can be repeated until four of the buggies stand one above the other.

Fig 4 shows the first railway cars that were actually ferried across the river and shows the ferry leaving the Point Levis side of the St. Lawrence with cars for the Quebec side. The success of the excellent work of the elevator and providing of the buggies is due to the Parkin Elevator Co. The ferry has been given severe tests, ferry cars with stone, weighing seventy tons, but the elevators will lift up to 120 tons. The test was made under the supervision of the officers of the Ferry Company and a number of officers of the G.T.P., H. E. Whitenberger, general supt. eastern division; J. J. Connolly, supt. eastern division; McCooe, supt. maintenance of ways, and A. Findlay, inspector bridges and buildings.

CANADIAN MACHINERY AND MANUFACTURING NEWS

A monthly newspaper devoted to machinery and manufacturing interests mechanical and electrical trades, the foundry, technical progress, construction and improvement, and to all users of power developed from steam, gas, electricity, compressed air and water in Canada.

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Vol. V. August, 1909 No. 8

GUARD DANGEROUS MACHINES.

Had not the smock worn by an employe of the London Street Railway power house given way, he would have met a terrible death by contact with a four-foot wide belt, recently. As it is, he is suffering from a badly crushed chest, bruised arm and body, but will recover. The point we wish to make is that more time and thought should be given to the protection of belts, pulleys, machinery, etc. The writer has seen men twisted up in drill presses and seen men get fingers mangled from unprotected gears. In some shops, attention has been given this matter, but there is room in a great many yet, for the instalation of devices to protect the workmen.

Factory Inspector Fred Kellond, in his report to the Ontario Government, draws attention to the necessity of more attention to this matter:.

"Modern industry is becoming increasingly more dangerous, and in the many varied processes involved many cases of accident, resulting in the injury, sometimes in the death of the employe, inevitably occur. The utmost precautions on the part of both employer and employe might reduce the number of accidents, though one can never hope to entirely stop them; but every effort should be made to decrease the number and to reduce the possibility of injury.

"The guarding of machinery and dangerous places forms a very important part of an inspector's duties. I have been able during the past year to have a large number of guards put on different machines, as well as have dangerous places, such as holes in floors, drive belts, etc., guarded. I have experienced very little difficulty in having my wishes carried out, especially after the second visit. I say second visit, for perhaps in this connection, if in no other, frequent inspection is fruitful of good results. In previous years the small number of inspectors in the province rendered it impossible for inspectors to see that their recommendations of improvements in factories were followed up; but with the increase in the staff more frequent inspection is possible, and the procrastinating manufacturer gets a reminder in the person of the inspector, who drops in to see "how that guard works." Another difficulty, I regret to say, that I have met with is the statement that, "My men will not use guards." This is most frequent in woodworking machinery. Jointers, saws, and shapers are the machines in connection with which this statement is made. While I believe this statement to be true in a number of cases, my opinion is that if an employer can make certain rules which he expects his men to observe, i.e., "no smoking," "start at 7 a.m., work till 6 p.m.," and the employes breaking these rules are promptly discharged, why can he not make a rule that guards must be used, and further see that they are used?"

FINE FINISH ON MACHINERY.

Recently one of the large railroad companies introduced an innovation among engine drivers which met with such results as to make it necessary to return to their old system. It was thought by some in authority, that by having the engineer take out any engine that was ready, a great saving in time would be made. The results were far from satisfactory, however, and the old order again came into force, of an engineer taking care of his own engine.

It is well known that an engineer takes a great pride in the engine committed to his care He speaks of it as if it were a living being, and handles it with affection. The same should be the case with the machinist, the machine operator in the machine shop, or the engineer in the power plant. He should take a delight in seeing his machine look well and run well. It should give him pleasure to see it looking bright and clean. To make the machinists enthusiastic about this, machinery should be symmetrical and have a good finish. The machine must possess some attraction for the eye just the same as a handsome suit of clothes. We might all wear burlap, but the resultant economy would be imaginary. The average man would lose more in efficiency and self-respect than he would gain by the saving in cost.

Consider two machine tools that are built with the same accuracy, and the same capacity for work, the one with handsome lines and fine finish should be given the preference every time, even if there is a slight difference in price. It will pay the buyer to pay the extra amount to obtain the finely finished machine. Man is largely influenced by his environment and with a fine equipment the mechanic will help to keep the shop spick and span. It will not only look better, but it will pay. It will arouse an interest among the mechanics that will be a valuable asset.

From the standpoint of the seller, too, the symmetrical design and handsome finish of a machine, add to its selling qualities and make an impression upon the prospective purchaser. A fine design and finish will at once suggest careful workmanship and a poorly finished machine, the reverse. It is, therefore, important that machines should be of good design and fine finish.

CANADA'S ANNIVERSARY.

Canada's anniversary month (July) is made notable by distinct signs of progress. Throughout the land, the crops are flourishing wonderfully, climatic influences have been most favorable, and the country's industries are springing into new life under the stimulus of a hopeful harvest outlook. One of the most important events of the industrial world has been the beginning of huge improvements in the maritime steel plants, not only at Sydney, but at Amherst, and the resumption of full-time in various railway shops and large manufacturies. A statement of the general manager of the Dominion Iron & Steel Co., that he had been authorized to proceed immediately with the outlay of $2,500,000, for the erection of a blast furnace, a full completion of coke ovens and a merchant mill.

W. C. Franz, manager of the Lake Superior Corporation, Sault Ste. Marie, Ont., announces that the new No. 3 open-hearth furnace of the steel works has made its first steel. The foundation work on No. 3 blast furnace has been started, and it is expected that work will be begun on the new structural steel mill at once. It will require one year to complete the blast furnace, and about seven months to have the structural mill ready for operation.

The Nova Scotia Steel & Coal Co., which has not attempted operations on the scale of the plants at Sydney and Sault Ste. Marie, now looks toward larger things, preliminary to which a $6,000,000 bond issue is being broght forward. The company's large resources in coal and in the Newfoundland, or Watana red hematite, ores, that are the dependence of the Sydney industry, entitle it to a larger place than it has yet undertaken to fill.

These developments in the affairs of the leading steel companies of Canada point to expansions such as have not been possible in the difficult years through which these enterprises have passed. The companies will now be placed in a much more important position than they have heretofore occupied.

THE HARDNESS OF METALS.

At the recent meeting of the British Iron and Steel Institute, a paper was read entitled "Notes on Tests for Hardness." in which the methods used were described. The four principal methods of making hardness tests are: 1. Turner's sclerometer—A weighted diamond point is drawn, once forward and once backward, over the smooth surface of the material to be tested, the hardness being measured by the weight in grammes required to produce a standrard scratch. 2. Shore's scleroscope—A small steel cylinder with a hardened point is allowed to fall upon the smooth surface of the material to be tested, and the height of the rebound of the hammer is taken as a measure of hardness. 3. Brinell's test—The hardness is measured by the indentation of a smooth surface by a standard steel ball under a standard pressure. 4. Keep' stest, in which the hardness is measured by the power of the material to resist the penetration of a drill.

The results obtained by each of these four tests are comparable for relatively pure metals in their cast or normal condition, but the results are not so satisfactory in the case of metals that have been hardened by mechanical treatment. The second and third tests give results which depend on the tenacity and elasticity of the material. Thus a piece of hard-rolled copper gives a greater hardness number than that of mild steel. A tool made of mild steel will, however, always cut, and is therefore harder than even the hardest of hard-rolled copper. The first shows comparatively little difference in the hardness of hard-drawn and annealed copper. Varying results by the different methods are obtained in testing the loss of hardness due to tempering hardened steel. There is thus a field for further investigation in measuring accurately the hardness of metals.

THE FRANCO-CANADIAN TREATY.

The French Chamber of Deputies has finally ratified the Franco-Canadian trade convention, as negotiated by Hon. Messrs. Fielding and Brodeur in 1907, and amended in a few minor particulars by a sub-convention last January. Under the terms of this treaty Canada will receive all the minimum rates of the French tariff, with the exception of the rate on cattle fattened for slaughter, which will pay the general tariff.

As pointed out in the April issue of Canadian Machinery Canada will enjoy the minimum tariff of 5 per cent. on agricultural implements. European companies enjoy the privileges of this tariff, compared with 20 per cent. levied on this machinery imported from other countries.

By the treaty, Canada will enjoy the minimum tariff on a number of natural and manufactured goods, including wood, metals, grain, agricultural implements, machine tools, electric motors and generators, etc. The treaty calls for a direct steamship service between the two countries. No transhipment of goods may be made, except where a country enjoys the privileges of the minimum tariff. That is, France may use the port of any third country enjoying the privileges of Canada's preferential or intermediate tariff, and Canada may tranship at the port of any third country enjoying the French minimum tariff. The treaty should stimulate the export of Canadian-made agricultural implements and finished products in iron and steel.

TOPICS OF THE MONTH.

We have received information that the International Harvester Co. have prepared a profit-sharing plan, which has been submitted to the employees. According to the plan, 12,500 shares of the preferred stock of the company will be offered to employes at $6.50 a share below market price, and 15,000 shares of common stock at $10 a share below the market. This offer will hold good until August 15.

* * *

We have made reference on several occasions, recently, in these columns to Germany having its eyes on Canadian trade. Efforts of the German Government are being backed with the greatest enthusiasm by merchants and commercial magnates. Scarcely a day passes without the attention of traders and exporters being drawn through the press to Canada as a field for German enterprise. The Berliner Lokal Anzeiger will despatch in August its naval correspondent, Captain Von Pustau, to the Dominion to make an exhaustive tour and to write a series of articles. Von Pustau will also interview Canadian statesmen in order to bring to their notice the recently-formed German-Canadian Economical League, and will investigate the prospects for a better commercial understanding in the near future.

* * *

A train load of 20 cars of harvesting machinery was shipped to Winnipeg and points further west by the Massey-Harris Co. of Toronto, on June 23. Unusually large orders from the west have been received this season, and the company is shipping an average of five carloads per day. This is surely a sign of the condition of trade in Canada.

FOUNDRY PRACTICE AND EQUIPMENT

Practical Articles for Canadian Foundrymen and Pattern Makers, and News of Foundrymen's and Allied Associations. Contributions Invited.

THE MURPHY BOUNCER.

James A. Murphy, foundry superintendent of the Hooven-Ovens-Rentschler Co., Hamilton, Ohio, has recently invented and constructed a new type of jarring molding machine which he has named the Murphy Bouncer.

The general appearance of this machine when removed from the pit for photographing is shown in Fig. 1. It will be noticed that it differs from other machines on the market. The principal difference is that in place of attaching the table to the piston it has been attached to the cylinder, the piston being stationary and connected to the base, while the cylinder is arranged to move up and down upon it and carries the table with it. This construction permits the casting of heavy ribs on the outside of the cylinder walls to support the table, thus giving a most rigid arrangement.

The impact of the falling table is taken on a series of steel pins shown about the base of the machine. The air for operating comes in from an opening on one side, and is admitted by a cut-off valve controlled by an adjustable tappet on the side of the cylinder, as shown clearly in the illustration.

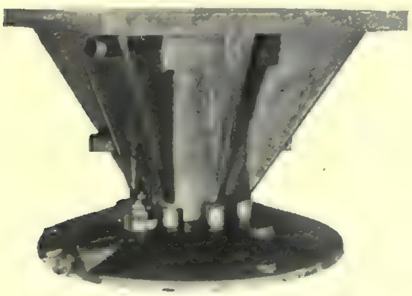


Fig. 1.—The Murphy Bouncer.

The valve proper rests on springs and when air is turned onto the machine the table immediately starts up. If the tappet is adjusted to its lowest point the cut-off valve is considerably below port entry for the air when the stroke begins, hence air will be admitted for a considerable portion of the stroke. As the tappet is run back the springs throw the valve higher and higher, thus causing the valve to cut off earlier. This enables the air to be used expansively in the cylinder.

Of course, when very heavy work is to be jarred it is necessary to use full pressure air for the greater portion of the stroke. When light work is being used, great economy can be effected by cutting off the air early in the stroke.

The exhaust port is uncovered when the piston reaches its highest point, the exhaust port being through the walls of the cylinder and practically continuous about the cylinder. The exhaust pipe shown at the left in Fig. 1 is connected by a hose to the stationary exhaust pipe in the pit. The arrangement of the machine as shown keeps all of the working parts free from sand or dirt. On the bottom of the base plate Mr. Murphy arranges a segment of a sphere, as shown in Fig. 2, so as to distribute the thrust equally to the foundation. The machine is mounted on concrete.

As installed in the plant of the Hooven-Owens-Rentschler Co. the machine is arranged with a flat iron table each side of the machine proper. The workmen places on one of these tables a bottom-board pattern and drag, and shovels in sand. As soon as the machine is idle the drag is slid along the iron table on to the machine, where it is jarred and then immediately slid off on to the table, where the parts were assembled.

In the meantime the men on the opposite side of the machine have prepared a drag for ramming. In this way the crew of men keep the machine fairly busy. The patterns are ordinarily left in the

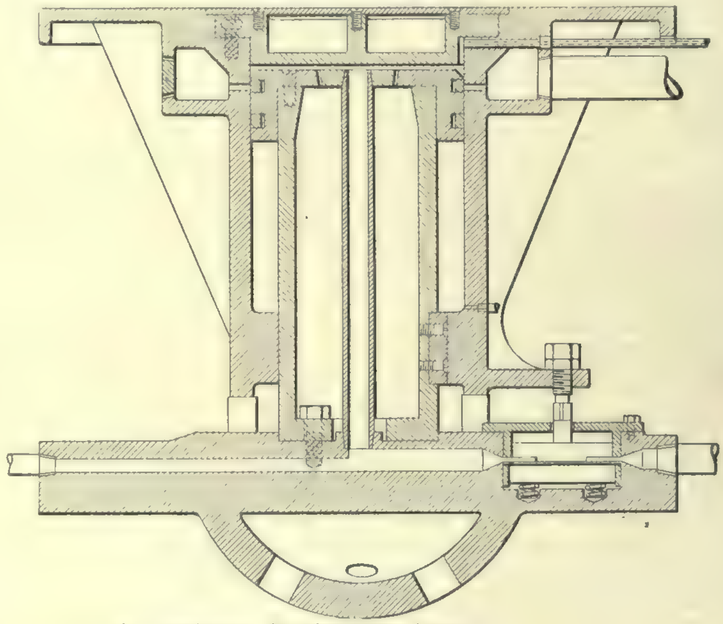


Fig. 2.—Section Showing Valve Action.

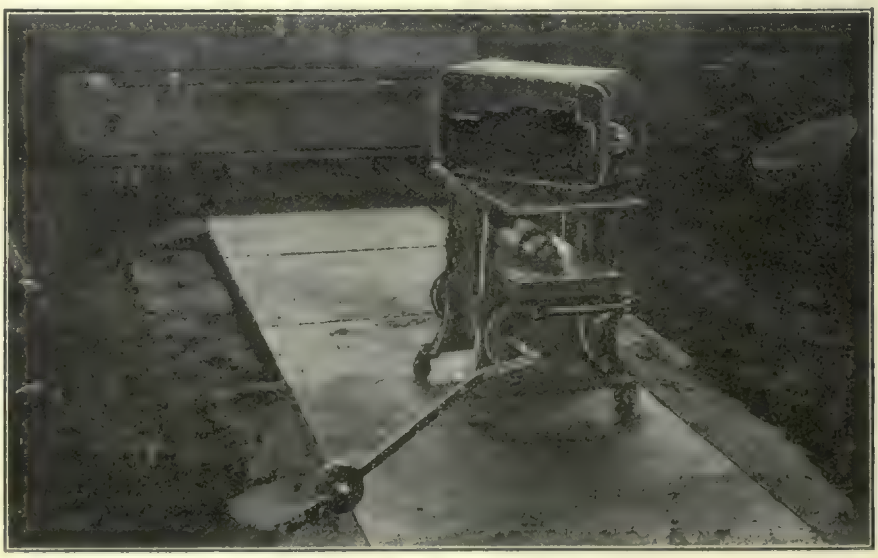


Fig. 3.—Machine With Side Tables.

drags until they are carried to the floor where the copes are rammed by hand.

They sometimes use Pridmore molding machines, however, the machines being mounted on casters and run on to the jarring table after the flask has been filled with sand. The machine is then removed and the pattern drawn in the ordinary way. In this way the jarring machine may be used for ramming the molds from two or more Pridmore machines. Fig. 3 shows the machine with a Pridmore molding machine upon the side table on plate after ramming.

Fig. 4 shows a general view of the floor taken a little after 3 o'clock in the afternoon. At the time this picture was taken there were 53 molds on the floor for castings ranging from 50 pounds to 2,000 pounds. This work was done by 6 molders, 5 apprentices and 2 laborers. All of the drags were rammed on the Murphy bouncer, while the copes were rammed by hand. In cases where flat-backed copes are required, these could also be rammed on the machine but none of the molds shown in this illustration are of this type. Some of them were quite complicated, requiring drawbacks in the cope or having the patterns so arranged that various parts of it had to be picked in during the pattern drawing operation.

Fig. 4.—A Floor of Molds with Machine-rammed Drags.

Mr. Murphy has not yet been able to work the machine to its capacity, because he has not had work enough available on the floor. The machine crew do no pouring, and by working during pouring time they have on the floor a drag ready for each one of the regular molders to begin work on in the morning, so that the molders work a full day molding copes.

One of the jib cranes serves the jarring machine floor, and the traveling crane carries the drags from the machine to the floor, and later in the day takes care of the pouring, shaking out, etc. The stroke of this machine can be varied to suit conditions, but as constructed at the plant described it is three-fourths of an inch.

TO PREVENT BUBBLES IN IRON CASTINGS.

Bubbles in iron castings are caused by evolution of carbon monoxide and other gases in the process of cooling and solidification. The formation of bubbles, which greatly diminish the strength of the casting, can be prevented by the addition of certain metals and alloys, which absorb oxygen and facilitate the elimination of other gases by raising the temperature of the molten iron, making it more fluid and producing more or less agitation in the mass. Ferro-manganese and ferro-silicon, which were first employed for this purpose, make the grain of the casting much finer and increase its strength by 15 per cent.

But pure and easily oxidizable metals, such as aluminium, magnesium, or sodium, are far more effective and they do not, like the alloys above mentioned, affect the general quality of the casting. Aluminium is especially suitable for very hard iron containing little silicon. An addition of 1-50 to 1-20 per cent. of aluminium suffices to prevent the formation of bubbles. Magnesium has been used for several years in casting copper and copper-nickel alloys. It is now being employed in iron and steel foundries, in the form of an alloy with iron or with aluminium and in the proportion of 1-20 per cent. of the weight of the casting. Sodium has not yet been employed in practice. Calcium not only absorbs oxygen but eliminates dissolved hydrogen. It combines with the carbon of the iron to form calcium carbide, which is decomposed by the hydrogen. Thus the calcium is again set free and the hydrogen is converted into acetylene, which rises and burns at the surface. Experiments have recently been made with ferro-vanadium containing a large proportion of carbon and consequently unsuitable for the manufacture of special steels.—Scientific American.

HOT BEARINGS.

By H. H. Ward.

A hot bearing is ever a source of annoyance to the modern engineer, yet bearings do not become overheated through "pure stubborness"—there is always "a reason."

The fault, great or small is one which is always irritating to an engineer who likes to have his engine running smoothly, and economically. By economy I refer to the lubrication of the different parts of his engine. Sand-paper will not become smooth by being saturated in oil. This is true also in reference to the motion-work of any piece of machinery, the indiscriminate oiling of which will not prevent the bearing from running hot, once there is lodged sand, or other hard substance on its face. Therefore great care should be taken to see that your oil is perfectly free from any substance that may cause the bearings to run hot.

Flake graphite mixed in small quantities with the contents of your oiler is a preventive if not a cure in dealing with hot bearings.

If a bearing becomes so heated that the babitt is being melted let it clean itself entirely out, then sprinkle thoroughly with sulphur. This has been found to be an excellent remedy for cooling hot bearings, and is well worth trying.

Too much troweling of the mold surface closes the pores of the sand and tends to a spoiled casting as the result of blow or kick. It is better to finish the face of a mold with a brush or with the hand.

The Detroit Foundry Supply Co., Detroit, has just placed on the market a facing for steel foundries that will allow of printing the pattern back and eliminating the use of nails for plate work. This the company calls its "Shakeon facing."

Mr. T. Y. Sherwell of the Drummond, McCall Co., Montreal, sailed for England, Saturday, July 17th. He will be gone about a month and on his return will be accompanied by Mrs. Sherwell.

J. R. Baxter & Co., 102 St. Antoine St., Montreal, have been appointed sole Canadian agents for Gooderich Rubber Co., Akron, Ohio.

It is stated that the Michigan Central Railroad will commence shortly the erection of a new depot at Windsor, estimated to cost $75,000 to $100,000.

The Paris Agricultural Society is asking for tenders for a new exhibition building.

The Work that is Applicable to Permanent Molds*

Statements Made and Conclusions Formed are Directed Towards that Branch of Foundrymen's Work Applicable to Permanent Molds.

By EDGAR A. CUSTER, Tacony, Pa.

Some twenty years ago the late Harris Tabor brought to the attention of the writer a machine for making break-shoe molds. He was very enthusiastic over it, and predicted that in a very short time all the foundries would be making their duplicate work with that class of machine. He had worked at it long and earnestly, and believed that it would win instant recognition. He lived to see the molding machine field extending far beyond his wildest dreams, but it took twenty years!

To such an extent has this feature of the founding art grown that to-day we have molding machines, each of which cost more than the entire equipment of an ordinary foundry thirty years ago. The modern manufacturer is under the necessity of keeping down shop costs, and his constant endeavor is to substitute machines for manual labor where possible. It is this tendency that has of late years turned attention to the question of how far permanent molds may be used to reduce the cost of production. It is not a new question by any means, but the information available is very meager.

It is the purpose of this paper to give a full and free account of the conclusions formed after three years of constant work on the problem, and if it promotes a good healthy discussion the main object has been attained. It must be understood, however, that this paper deals solely with work that is applicable to permanent molds and the statements made, and the conclusions formed, are directed only toward that branch of the foundryman's art.

The subject may be taken up under the following heads:—

(1) Of what material should the molds be made?

(2) What effect has such a mold upon the castings?

(3) What effect has molten iron upon the molds?

(4) What remedy should be applied for any bad effects shown?

These four points having been carefully considered, and the efficiency of such a mold conclusively demonstrated, the value of the permanent mold for certain classes of work is established.

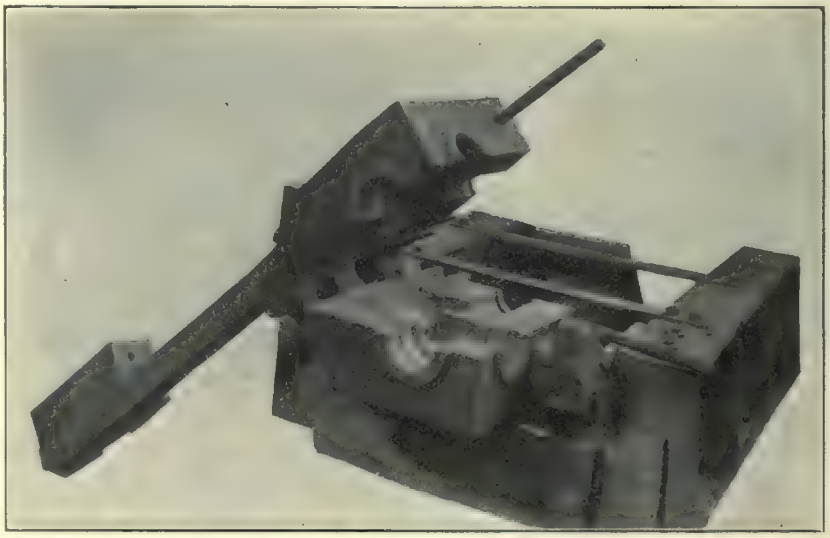
* Read before the A. F. A. convention, Cincinnati, June 1909. The paper is divided into two parts. The second part will be given in the September issue of Canadian Machinery.

The ideal material for permanent mold would be one that would not chill the molten iron, would stand swift heating and cooling without disintegration and would be capable of being machined or molded into the shape required. This material should be very nearly as hard as iron, quick to conduct heat and of low specific gravity.

There are a number of substances that fulfil these requirements in part. Lava rock will stand the sudden changes of heat and cold, can be cut into the shape desired, and does not chill the molten iron. When a coating of finely ground mica or some other inert substance, is rubbed into such a mold it will give beautiful castings. But it wears away rapidly, and soon needs renewal. Were it not for this fault it would very nearly solve the problem. We found it extremely difficult to handle and prepare this substance, and this led us to seek a material that would possess both hardness and ability to stand the heat changes. Cast iron has been the favorite medium, and so far, nothing has been brought forward that is so well adapted for foundry work. It has the advantage of being easily machined, and the added advantage that it is formed by a process with which we are all familiar, while its possible disadvantages are more easily overcome than those of any other substance.

It is not much trouble to make and machine an iron mold, and we can calculate the expansion and contraction to a nicety. Its great drawback is its chilling effect. Some investigators make the claim that if the mold is heated to nearly the temperature of the casting, when it is ready for removal, no chilling effect is perceptible; also that the molten iron should cool at the same rate in a permanent mold as it does in a sand mold. To both of these propositions I would answer that they defeat the object of permanent mold work, in that they destroy the permanence of the mold, confer no benefit on the finished product and set up a multitude of difficulties such as core-crushing, shrinkage strains, and segregation.

But these two claims have been so persistently made that it seems advisable to treat them at some length. We are all familiar with the rapid disintegration of cast iron when kept at a very dull red heat—the rapid oxidization and the tendency to sprawl and crack. When the heating and cooling is carried through a range of 200 or 300 degrees F. —and this must of necessity occur—the



A 4-inch Trap Mold Weighing 42 lbs.

mold becomes useless in an incredibly short time. Again, the molten iron will not lay close to such a mold, and the resulting castings are far from perfect.

It has been conclusively demonstrated that mold distortions due to heat become permanent after a temperature of 900 degrees F. has been passed, so that highly heated cast-iron molds seem to be out of the question. While there is no doubt that they would prevent chilling, the cost of such a method would be prohibitive . . . . Should the iron cool at the same rate in a permanent mold as it does in sand? The answer to this is most emphatically in the negative. The effect on the mold would be the same as main-

taining it at a high heat, and the time lost in cooling would slow the process up materially. Slow cooling would not improve the casting, nor would it prevent segregation. It would induce shrinkage strains, and in fact would be no improvement over the present sand-casting method, except that it would obviate sand ramming.

Effect of Mold on Casting.

When we first contemplated using permanent molds it was considered a foregone conclusion that unless the interior of the mold was heavily coated with some inert substance, the casting would necessarily be chilled, and extensive arrangements were made to prevent or to remove this chill. For a time the molds were carefully coated after each pouring, but, in our efforts to gain time this coating was neglected, and we noticed that even when this was the case no chill appeared provided the casting was removed above a certain temperature. Following this lead we found that when the surface of the mold was practically free of any coating, no gases were formed by

A 2-in. Lee Mold in Constant Use

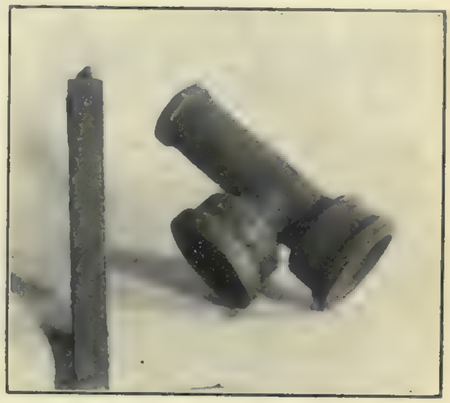
contract of the molten metal, and that chill could still be prevented by removing the casting at the proper temperature. Once these facts were thoroughly established all our attention was centered on the posibility or removing the casting as soon as it was set. A few trials proved beyond doubt that molten cast iron does not chill until after the casting has set, and it was simply a question of reasonably quick work to produce castings not only perfect in form and texture, but answering all the requirements for high-class marketable work.

The next step in this line of reasoning was that if the contact with comparatively cold iron on one side, did not necessarily chill the casting, then contact with iron on both sides need not chill it. To demonstrate this point several thin sheets were cast between heavy plates and removed without chilling. This suggested the possibility of using metal cores, provided these could be removed before being caught by the shrinkage and immovably held or the casting cracked. Reasoning that cast iron does not contract until after it is solid, we believed that it would be possible to remove a core before such contraction occurred. This was tried first on the T-shaped fitting, the entire core being made of cast iron, in two parts, one part for the main body and one part for the branch. These core parts were fitted to the mold and metal was poured around them, and it proved to be not only possible, but very easy to withdraw the core, provided it was done when the casting was at the proper temperature. Nor was the allowable time for the withdrawal of the core so short as would be expected. In fact, it was necessary to wait a few seconds after pouring, before removing the core.

If, then, an iron core could be easily withdrawn from a tube one foot long, it was possible that it could be withdawn from a tube 5 feet long. This was attempted, and repeatedly accomplished, a four-inch pipe 5 feet long being cast on an iron core and the core removed before being gripped by the contraction of the pipe. We found by these trials that no gases were formed other than those from the air in the mold, and if this air was allowed free vent no trouble was experienced in filling a mold of any shape or size, and in removing the resulting casting at such temperature as to avoid white chilled crystals.

The next step was to determine what size and shape of mold was best adapted to this process. This was a long and tedious investigation, most of the results obtained being of a negative character. It is almost impossible to formulate any set rule as to size and shape of mold for various castings. The one general rule of allowing a surplus of metal in every case seems the best practice. This is, of course, very indefinite, and experience only will show what is best. The mold in which this trap was cast weighs 1,700 pounds, and the 2-inch tee mold confesses to over 500. The advantage of providing a large bulk of iron is too great to be ignored when it is considered that the objects desired are not only to swiftly remove the heat from the molten iron, but also to provide enough metal to store this heat and resist the tremendous strains imposed.

It is to be observed that in using these molds we take no precautions against shrinkage. We depend altogether upon the fact that chilling molten iron swiftly to the point of setting makes castings that are homogeneous, and thus the shrinkage strains due to irregular cooling are reduced to a minimum. The main object to be accomplished is to secure rigidity of the mold in all its parts—there is always time enough to remove the casting and retain the shape given it by the firm unyielding surface. A mold that has thin walls—1½ or 2" thick—will spring away from the molten iron under the influence of the intense heat, and the casting will invariably follow the spring. Molten iron, like water, moves in the line of least resistance. Its peculiar property of increasing in bulk when passing from the molten to the solid state makes it possible to get a casting that fills every crack and cranny of the mold so long as this tendency to swell is successfully resisted. This same mass of iron in the mold, by reason of its rigidity and its capacity for quickly transmitting and storing heat, will greatly lessen the liability to cracks in the mold cavity. The only place where any deterioration sets in is where the molten iron strikes in the gates, and our experience has shown that we can safely neglect this item.



Effect When Castings are Taken From Mold Interior Still Mo ten. Globules of Iron on Surface of Lee and Irregular Excrescence on Top of Bar.

How long a cast-iron mold will last has not yet been determined. So far, we have made over 6,000 pieces in a single mold, and it is in better shape now that when we started. There is no reason why its life should not be indefinite, although there must be a point of time and service when the cast iron has reached its ultimate capacity for work. Our statistics show that the life of the mold depends, not upon the number of pourings, but upon the number of times the mold is allowed to become entirely cold and then reheated. Continuous pouring, when correctly timed so as to preserve a generally even temperature, has but a very slight tendency to crack the mold. It is only when it is allowed to cool that the cracking becomes at all noticeable, and then only in the gates.

Queen's University, Kingston, will erect two new science buildings one for chemistry and the other for mining and metallurgy. A new club house will also be erected.

New Plant of E. & T. Fairbanks & Co., Sherbrooke

The Construction and Equipment of this Company's Plant for the Manufacture of Scales, Valves, Power Hammers and Other Specialties.

There was a time when all weighing was done by means of beams or steelyards, but this method was found to be too slow and the inventive genius of Thaddeus Fairbanks brought out the Fairbanks' Platform Scale in the year 1831. The resulting economy in time and labor has proved of increasing value in every industry. Hundreds of modifications from the original size and style have come into daily use and there are few weighing requirements for which specially adapted scales have not been designed.

The buildings making up the Fairbank's Scale factory are situated in the centre of the town of Sherbrooke at a point where the plant is well served by the C.P.R. and G. T. R. The buildings extend from east to west 303 feet with a varying width of 63 feet to 115 feet.

The Foundry.

The iron and brass foundry is located in the west end, and has an annex for storing sand and clay on the ground floor of the cupola house. There is an elevated charging floor, with a coke storage compartment on the same level. The coke is elevated by means of a bucket conveyor from alongside the railway siding, where it is dumped from the cars and put into the building through a chute and opening in the roof. The molding sand is carried up in the same elevator, and is spouted to a bin on the ground floor below the coke storage bins.

The iron for the cupolas is elevated to the charging floor by means of an Otis-Fensom elevator, in front of which is located a 3-ton scale which weighs all charges before they go to the elevator.

The core room adjoins the cupola house. It is equipped with Millett core ovens for baking the cores. The foundry floor is 75 feet wide by 60 feet long, one-third of which is reserved for brass work, and the remainder for cast iron. A 60-inch Whiting cupola has been installed, and provision has been made for the addition of a future cupola of 72 inches diameter. A 10-ton Niles traveling crane conveys the metal from the cupola to the flasks, and runs up and down the building in the centre of the three bays. The brass melting section is fitted with a Swartz melter. It is equipped, also, with the usual crucible melting pots set in a pit on a level with the floor, so that either or both methods of melting may be used.

Machine Shop.

A two-storey building, 60 feet wide by 110 feet long, which is used as a machine shop and cleaning room adjoins the foundry. The cleaning room takes up three bays, or 30 feet, next the foundry. This building has an open well 70 feet long, over which a 7½ ton Niles traveling crane operates. The second floor is in the form of a gallery on which are located light machine tools. An Otis-Fensom elevator has been installed between the ground and first floor of this building.

The machine shop is equipped with a full line of modern machine tools for not only manufacturing purposes, but also for making their own special tools, and for doing all necessary repair work.

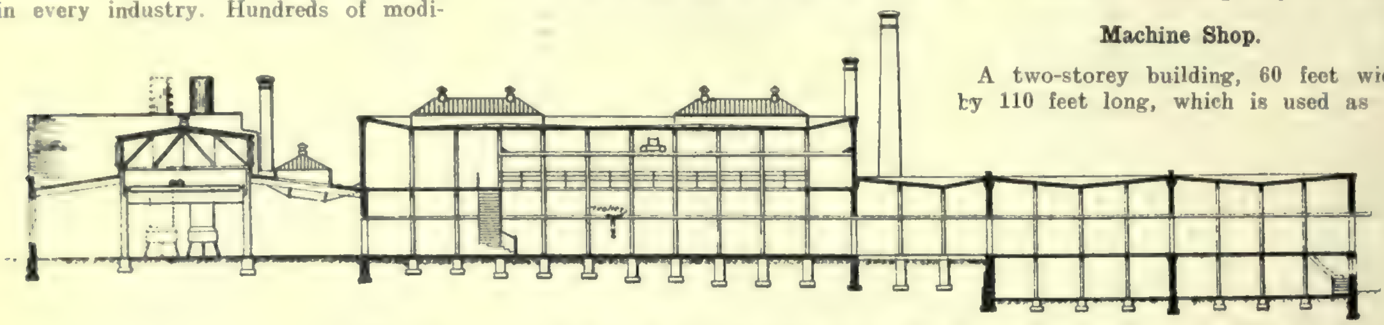


Fig. 1.—Longitudinal Section E. & T. Fairbanks Plant, Sherbrooke.

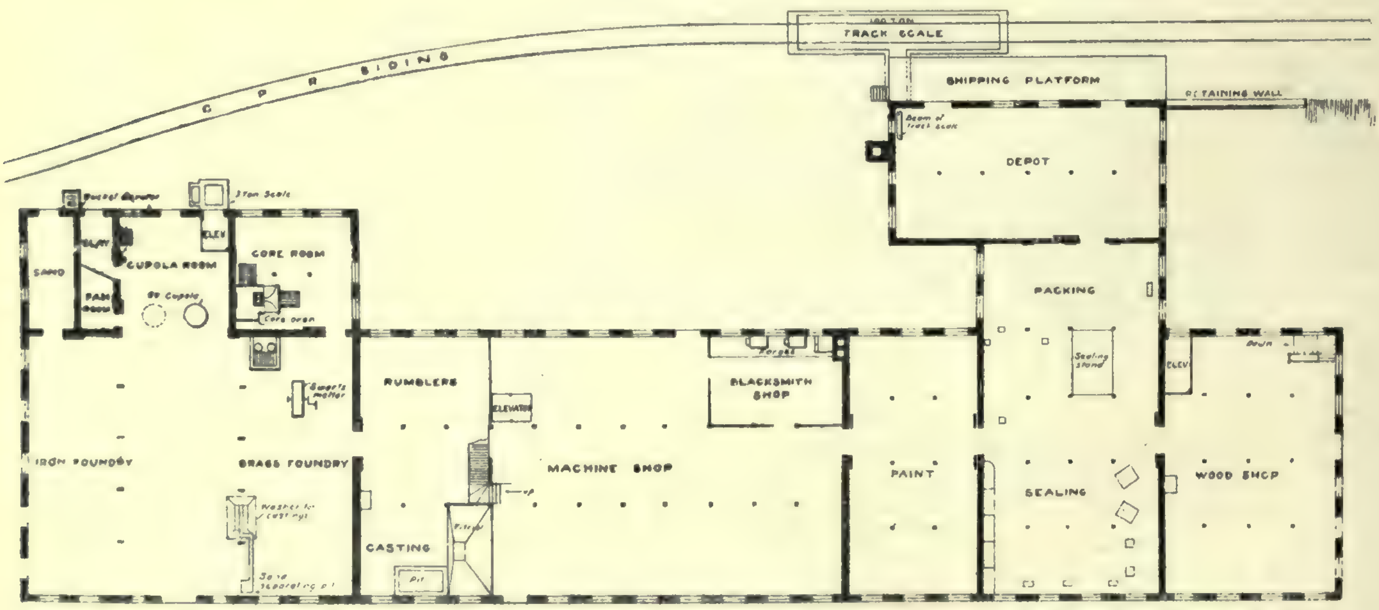


Fig. 2.—Ground Floor Plan E. & T. Fairbanks Plant, Sherbrooke.

A space 21 feet by 30 feet in the gallery floor of the machine shop is set apart as a tool room, which is conducted on the principle whereby each workman is held accountable for the tool temporarily in his possession.

Other Departments.

Next the machine shop is located a building 30 feet by 60 feet, which is known as the paint shop. Beside the paint shop is situated the sealing and packing department, a long building about 40 feet in width. In this department the various parts are assembled and tested, sealed and finally packed for shipment, the depot being located at the end of the packing room.

On the south side of the sealing room is located the wood working department, 40 feet wide by 60 feet long, with a 10 foot basement underneath. An elevator with a 14x6 foot car, operates between the basement and first floor of the wood shop. This department has an equipment of the most improved machinery, including Fairbanks' saw tables.

The blacksmith shop is a department off the machine shop. It is equipped with forges, power shears, power hammers, etc.

Construction.

The buildings throughout are built with monolithic and reinforced concrete foundations which are carried up to the first floor level where the walls are continued in red brick set in lime cement mortar. The floors are 2-inch by 4-inch spruce on edge and ⅞-inch hardwood flooring on top, with heavy timber beams and columns, the construction being known as slow-burning or mill construction. Each department is divided from the other by means of brick walls, with tinned standard automatic fire doors.

The arrangement of the departments is such that the raw materials come in at one end crude, pass through the factory and go out the other end finished, with all unnecessary lifting and handling eliminated.

T. Pringle & Son, Limited, Montreal, were the engineers and architects, and had charge of the design and supervised the construction.

Heating and Power Equipment.

The heating is accomplished by a boiler in the depot shown in Fig. 2, with a low pressure direct radiation system, Bundy traps being installed throughout the plant to return all condensation to the boilers.

The heating system was installed by A. R. Wilson, Sherbrooke, the electric wiring by Scott & Rubestein, Montreal. The structural steel was fabricated by the Structural Steel Co., Montreal. The electric motors, cranes and machine tools were supplied by the Canadian Fairbanks Co., Montreal.

Power is supplied by the Sherbrooke Electric Power Co. at 110 volts, this being stepped up to 220 volts outside the building for power. The lighting is at 110 volts, Adams-Bognal arc lamps and incandescent being used.

Fig. 1 is a longitudinal section, Fig. 2 a ground plan and Fig. 3 a general view. One railroad siding is shown and another runs along the front of the buildings.

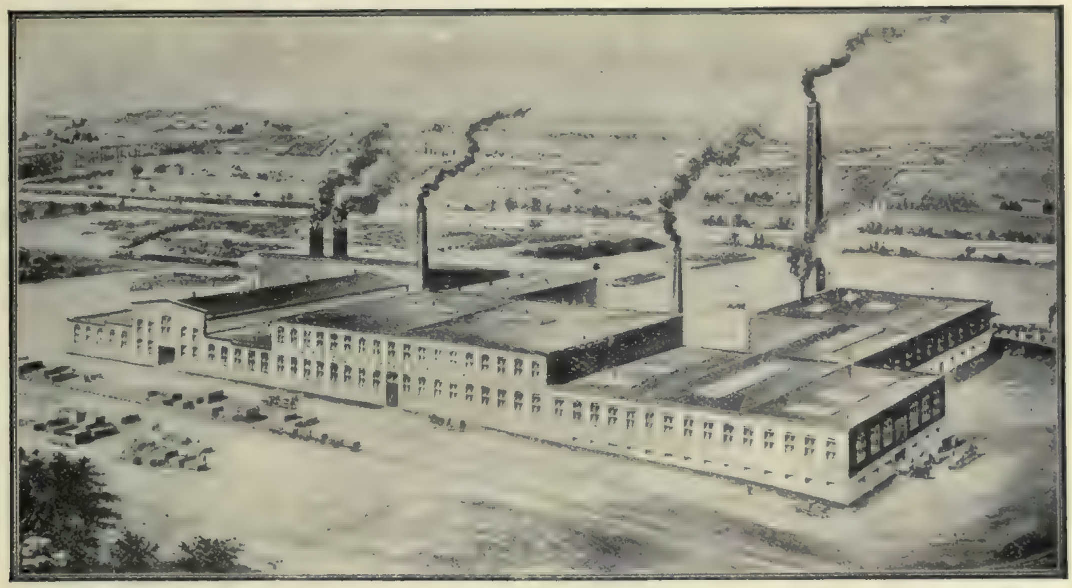


Fig. 3.—New Fairbanks Scale Plant at Sherbrooke, Quebec.

CURING HOT BEARINGS.

By E. B. P.

The bearings on a belt-tightener pulley which carried the main driving belt 48 inch in width caused me some anxiety from heating for some few weeks after being installed. These bearings were of the self-oiling, self-aligning variety and had independent oil-cellars at each end of the bearings. The trouble seemed to be caused by the oil creeping on the shaft from one cellar to the other and then being thrown out upon the floor. Thus one end cellar would become dry, and heating would result. After taking these bearings down a couple of times, and scraping them the idea came to my mind to join the cellars.

Each oil-cellar had an ⅜ in. plug in the bottom for draining it, and, by taking out these plugs and by using some nipples, ells, and a union the job was soon done and the trouble was over.

The B. C. Electric Railway is to spend $2,000,000 during the next two years on a power plant at Victoria, B.C. The railway system will be extended and the company agrees to reduce the rates charged for lighting and power.

Sarnia ratepayers have voted in favor of the extension of the gas franchise to the Sarnia Gas & Electric Light Co., for a term of twenty years, the by-law being carried by a majority of 555. The Sarnia Gas Company have completed a contract to pipe gas from the Tilbury field and sell it for fourteen cents per thousand feet for manufacturing purposes and thirty cents per thousand for domestic use.

INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News.

Foundry and Machine Shop.

B. Dawson, of Campbellford, Ont., is arranging preliminaries for the location of a large bridge building works at Port Arthur.

Yarmouth ratepayers have ratified the agreement empowering the town to grant a concession to the new Burrell-Johnson Iron Co.

The foundation has been commenced for an addition to the Maple Leaf Tool Works, Tillsonburg, for the manufacture of handles. Other extensions are contemplated.

The Polson Iron Works, Toronto, will lease for twenty years the dry dock at Owen Sound. The same company is looking for a larger site in the Ashbridge Bay area at Toronto to erect a new plant.

The Polson Iron Works wish to build a drydock and transfer their shipbuilding and boilermaking plant to a site on Ashbridge's Bay and, the C.N.R. is desirous of building car works and machine shops in the marsh owned by the city of Toronto.

A proposition has been made by the London Foundry Co. to Louis Kindling, of Milwaukee, to manufacture the Kindling washing machine for Canada. A conference was held lately between the parties interested and a definite offer is under consideration.

Wheaton Bros., Folly, N.S., have been awarded the contract for the construction of a railway from the Drummond iron mines, in Gloucester county, to Bathurst, where smelters and shipping facilities will be constructed. The road will be 16 miles in length.

F. P. Jones, general manager of the Dominion Iron & Steel Co., at Sydney, C.B., states that he has received authority to spend the $2,500,000 voted for the expansion of the plant on the immediate construction of a blast furnace, a full complement of coke ovens, and a merchant mill.

Toronto city council has agreed to sell to the National Foundry Co., twenty-three acres of land and land covered by water as the site for a large iron-founding plant. The city gets $31,000 for the property, and the pledge that buildings to the value of $100,000 will be erected within a year.

The smelter at Boundary Falls and the mines of the Dominion Copper Co., in Deadwood and Phoenix camps, Boundary district, B.C., recently sold at public auction in Vancouver to the New York bondholders, will resume operations as soon as the work of reorganization can be rushed to completion.

New I.C.R. freight car and passenger car repair shops are to be built at St. John. They will be of the most modern and advanced style. The new building will be 125 feet long and forty-five feet wide. It will be a wooden frame of one story. There will be a wheel pit where the wheels can be conveniently taken off and replaced on the cars.

The Canadian Potato Machinery Co., Galt, has begun operations and has several men at work in the factory. Chain making has been commenced and the building of potato diggers is also under way. Manager Schreiber reports a good demand for the machinery which will be largely increased next season, when the machines will be better known.

The Fernie board of trade are considering a proposition of establishing a structutal steel manufacturing plant in the Elk valley. A large American firm, which has been constructing many tipples and other mining plants in this country, has concluded that it would be more profitable to have a plant of its own near the field in which so much work is to be done in the future. There are large iron deposits within easy reach of Fernie.

Rhodes, Curry & Co., Amherst, N.S., have absorbed the Malleable Iron Co. of that place and the entire concern will be reorganized with increased capitalization. Locomotive shops will be added to the industry and now it is announced that the transfer of the Rhodes, Curry business at Amherst has been made, and that the owners are C. Meredith & Co., and the Royal Securities Corporation, Montreal, and J. M. Robinson & Sons and W. B. Tennant of St. John, and J. R. Douglas of Amherst.

It is considered probable that in the near future Vancouver will be provided with a dry dock and machine shop to cost $1,250,000. The proposal is said to be taking definite form, as negotiations are in progress in Ottawa. The syndicate which is to undertake this work is headed by Nicol P. Thompson, of Vancouver, and the site which has been selected is the Ross and Howard Iron Works, on Burrard Inlet. It is thought that the dock will be large enough to accommodate the Empress liners.

J. C. and A. J. Macdonald, proprietors of the Grand Forks, B.C., Machine and Structural Iron Works, are looking over the situation with a view to starting an establishment at Vancouver. They have received much encouragement from individuals prominently connected with the building trade. The firm has two plants in the Boundary district, where the mines brought considerable business, but with the relaxing of the activity of this industry it is proposed to move the larger to either Spokane, Vancouver or Prince Rupert. At present, Vancouver is the choice.

McKinnon & Holmes, Sherbrooke, are erecting a large plant for the manufacture of structural steel work and bridges of all kinds. The building is steel and brick, the works will be equipped with up-to-date machinery. Some of the machinery has been ordered and will be installed as soon as the boilding is completed. The firm expect to be manufacturing about October 1. Mr. McKinnon was for a number of years with Jenckes Machine Co., Sherbrooke. Mr. Holmes has been connected with a large manufacturing concern in Philadelphia in the capacity of designer.

The engineering firm of McDougall, Jenkins, Ltd., has approached the city council of North Vancouver for concessions in the way of exemption from taxation and water rates for a period of ten years, in consideration of establishing a $75,000 machine, boiler and foundry plant. If terms were agreed upon, the company stated it would start with a pay roll of 70 men at $3.50 per day, and later on would double the force. The council were in favor of granting the exemptions asked for, subject to the city solicitor's opinion, there being a point as to whether the city could give free water.

Municipal Enterprises.

Work has begun on the New Liskeard water system.

Baddeck, N.S., is to establish a waterworks system.

Wingham's proposed waterworks system is estimated to cost $5,865.

Extensions are to be made to the sewer system at North Vancouver.

Regina is asking for tenders for sewer pipe and waterworks supplies.

Tenders will be received for sections of Chapleau's proposed water works system.

Morristown, Ont., is to vote on a by-law to spend $15,000 for a waterworks system.

The Toronto City Engineer will shortly call for tenders for eight miles of water mains.

Claresholm, Alta., ratepayers have carried a by-law to issue debentures for $56,000 for a water system.

Toronto is to ask for tenders for 31,000 feet of 12-inch water pipe for extensions in recently annexed districts.

The Vancouver Board of Works have adopted the scheme for the Mount Pleasant sewerage system. Estimated cost, $133,000.

Vernon, B.C., ratepayers have passed by-laws to issue $76,000, 5 per cent., 25 years waterworks and $30,000, 20 years, school debentures.

The Burridge-Cooper Co., Winnipeg, have been awarded the contract for the waterworks system at Estevan, Sask. Contract price, $50,000.

By-laws amounting to $313,600 in all have been carried by Regina ratepayers, of which $148,000 is for waterworks, and $9,000 for sewerage.

An engineer will report on the three plans and estimates submitted for new steel tower and tank for the waterworks at Shelburne, Ont.

Guelph now secures its drinking water from a spring five miles from the city. The new system, including a two-foot conduit, cost $35,000.

Work on the Carman, Man., waterworks system has begun. W. E. Porter, of Medicine Hat, has been engaged to work on and superintend the laying of the water mains.

City Engineer Benzie, of St. Catharines, estimated the cost of the proposed sewer on York Street at $7,200, and of that on Dacotah Street at $1,080. The recommendation in favor of this has been submitted to the council.

The B. C. Electric Railway is to spend $2,000,000 during the next two years on a power plant at Victoria, B.C. The railway system will be extended and the company agrees to reduce the rates charged for lighting and power.

Brant Bros., of Vancouver, who had the contract for building sewers at Prince Rupert, have thrown up their contract, and it is reported that the work will now be carried on jointly by the Provincial Government and the Grand Trunk Pacific.

By July next year, the Esquimalt Waterworks Co. expect to be in a position to deliver 15,000,000 gallons of water at Esquimalt from Goldstream. Already preliminary preparations have commenced on the work and within a short time active operations will commence.

A considerable amount of sewer construction is to be undertaken this season at Victoria. The most extensive work is that on Queen's Avenue, and immediate neighborhood, which it is proposed to operate by a system of pumps. To instal this system will, it is estimated, cost $11,700.

The Peterboro water commissioners awarded the contract for building the dam to the Bishop Construction Co., Montreal, and for the water wheels and pumps it was divided between the Wm. Hamilton Co., and the John McDougall Caledonian Iron Works, Montreal. The total cost of the dam will be $120,000.

Sarnia ratepayers have voted in favor of the extension of the gas franchise to the Sarnia Gas & Electric Light Co., for a term of twenty years, the by-law being carried by a majority of 555. The Sarnia Gas Co. have completed a contract to pipe gas from the Tilbury field and sell it for fourteen cents per thousand feet for manufacturing purposes and thirty cents per thousand for domestic use.

Railway Construction.

The Western Canada Ry. are building from Butte to Calgary.

An electric railway may be built from Edmonton to Pigeon Lake.

The C.N.R. line between Vegreville and Camrose is being built at the rate of three miles a day.

The Spokane International are extending their line into the Alberta and British Columbia coal fields.

The C.N.R. has decided to build twelve more miles of the extension into the St. Rose country, in Manitoba.

A by-law to provide $19,000 for double track work on the Berlin Street Railway will be voted on by the ratepayers on June 28.

Work on the new C.P.R. line from Thief River to Duluth will be rushed to completion. One hundred miles will be ready this year.

Engineer Cole, of the T. & N. O. Railway, is preparing plans and estimates for the extension of the line to Elk Lake and Gow Ganda.

The Hudson Bay & Pacific Ry., have filed the routes of their proposed lines from Fort Churchill to Prince Albert and the Pacific Ocean.

Development work is going ahead rapidly at Comox. The Fraser Lumber Co. is pushing on the railroad construction and material is arriving daily.

The Canadian Northern will this year construct a line from Buffalo to Ottawa. Mr. Mackenzie has been successful in raising $3,600,000 in England, much of which will be devoted to this purpose.

A French syndicate, represented by Short, Cross & Biggar, Edmonton, has applied to that city for franchises for the construction of radial railway lines with a total mileage of 160. The franchises will, in all probability, be granted, the council being strongly in favor of the proposition.

Wheaton Bros., of Folly, N.S., have been granted the contract for constructing the G.T.P. from the Drummond Iron mines in Gloucester Co., to the Town of Bathurst, where smelters and shipping facilities will be constructed. This road will be upwards of sixteen miles in length and a good sized crew are at work.

Within a couple of months fifteen thousand men will be at work on the National Transcontinental road on the lines east and west of Cochrane for 150 miles. Tenders have already been received, for an eight-mile extension of the Manitoulin & North Shore Railway from the thirteen-mile line already operating from Sudbury.

Electrical Notes.

Stirling, Ont., is to vote on a by-law to spend $10,000 for electric light purposes.

G. C. Mason has secured the contract for the erection of the new transformer house of the Falls Power Co., at Welland.

The contract for a motor generator set and switchboard panel for Vancouver was awarded to the Canadian Westinghouse Co.

The finance committee of Stratford's city council has been authorized to offer $30,000 for the electric light plant and equipment there.

The suggestion of Ald. Mills that $20,000 be raised by debentures for the distribution of Niagara power was endorsed by the Ingersoll Fire, Water and Light Committee.

The Colonial Engineering Co., have offered a proposition for the construction of Montreal's generating station for the purpose of lighting the streets at a cost not exceeding $40 per lamp a year.

The British Insulated and Helsby Cables, Limited, have sold their Canadian interests to the Canadian British Insulated Co., Montreal, the latter firm taking over the whole of the former's business, including Toronto's contract for electric light cables for the power distribution plant.

A special meeting of the directors of the Merchants' Light and Power Co., Montreal, was held recently at which it was decided to ask Messrs. Ross and Holgate, the experts who had charge of the installation of the municipal lighting plant in Westmount, to prepare plans for the electric plant of the company.

The property and buildings of the Olds Gas Power Co. at Saskatoon, has been purchased by the Saskatoon Electrical Co., for the purpose of carrying on foundry work, machine shop, electrical work, pattern making and blacksmithing. A company will be incorporated as the Saskatoon Electrical and Foundry works to carry on the work.

The Calgary Power and Transmission Co. will shortly commence a great work on the Horseshoe Falls on the Bow river, near Kananaskis. It is expected that the work will cost approximately $700,000. As soon as the contract is let the work will be commenced for the power plant to supply cheap power to Calgary. Smith, Kerry & Chase are the engineers in charge.

Lindsay has a mortgage of $1,500 on what is known as the Burleigh Falls Power, and G. H. Hopkins, K.C., has been instructed to look up the old agreement with a view to securing the power for Lindsay. Recently the company asked $150,000 for the Burleigh Falls Power, and the city of Peterboro made them an offer of $50,000. The offer is laughed at by the company.

The purchase by Montreal interests for several months past of the stock of the Quebec Railway, Light and Power Co., which recently gave the controlling interests to Montreal capitalists, interested in the Light, Heat and Power Co., has all along been understood to be the initial step to the amalgamation under the same management of the rival gas and electric light companies in Quebec.

A joint stock company is being formed to build dams at Gull and Long Lakes, in Addington county, to retain water for use by the power companies along the Mississippi river. The companies using the water for power uses will be assessed according to the benefits derived. It is said that this movement is the first step in the consolidation of all power companies at a future date.

The power lease at Healey's Falls, on the Trent River, held by the Northumberland-Durham Power Co., has been cancelled. An order-in-council declaring the forfeit has been gazetted. The action was taken on the recommendation of Hon. Frank Cochrane, Minister of Lands, Forests and Mines. This is the second lease this company, of which Sir Mackenzie Bowell was the head, has had, but the conditions have never been fulfilled and no power was ever developed.

The addition to the electric light station, in which will be placed the pumps for the Vancouver salt water system, is almost completed. The turbine pumps, which have been manufactured by the D'Olier Co., of Philadelphia, are expected shortly. There are two of them, one is to be operated by electric power, the other by steam. All the mains are laid and hydrants installed, so that when the pumps are in and in working order the additional fire protection will be an actual fact.

The Vancouver Power Co., capitalized at $2,500,000, has given notice that on August 11 application will be made under the Water Act for a license in the New Westminster District. The company wish to divert a part of the Mislilоet River, North Arm, Burrard Inlet, some 12 miles above the mouth of the river, for a water power plant for the purpose of generating electricity for mechanical, industrial and commercial purposes. The company wish some 860 cubic feet of water per second for this plant.

The B. C. Electric Co., will make a big addition to its plant at Victoria, whereby additional power to the amount of about 750 horse power will be provided. The steam plant which was formerly in use at Vancouver, has been brought to Victoria, and work on the erection of a power house will commence at once. The contract for the work has been let to Malcolm & Dinsdale. The cost of the erection of the power house and installation of the plant will be in the neighborhood of $50,000.

The Erindale Power Co., which recently purchased the power station on the Credit River, of the Southern Light and Power Co., and also the land holdings at Port Credit harbor, will spend $160,000 on the construction of the dam and the erection of buildings for the machinery at the station, with a view to delivering 1,000 horse power to the distributors, the Stark Telephone, Light and Power Co., within six months. The York County Loan Co., spent about $200,000 on the work. English capitalists are behind the Erindale power scheme. It is said that subsidiary companies will take over the Oshawa and Bowmanville holdings of the Stark Co.

The London Board of Directors of the British Columbia Electric Railway having voted to appropriate $2,500,000 for extensions and improvements to its system in Vancouver during the next twelve months, R. H. Sperling, general manager of the company, states that over half of the amount appropriated will be used for the construction of new tram lines in Vancouver. A new 10,000 h.p. water wheel and generator will be installed at the generating plant on the North Arm of the inlet at a cost of $250,000. A new dam will be erected at the mouth of Lake Coquitlam, to cost $200,000. Improvements will be made to the New Westminster interurban line between Vancouver and Central Park, which will involve an expenditure of about $200,000. The company will also equip the railway recently built by the Canadian Pacific Railway from New Westminster to Eburne along the North Arm of the Fraser to be operated by electricity. Several other extensions are also contemplated by the company.

Structural Steel.

Seaforth ratepayers of the county of Huron will shortly be asked to vote on by-laws to raise $20,000 for steel and concrete bridges.

W. J. Dunlop, secretary-treasurer of Shell River municipality, Man., is taking tenders for erection of a bridge over the Assiniboine river.

The contract for the superstructure of the bridge across the Madawaska river at Stewartville, Ont., has been awarded to the Hamilton Bridge Co.

City Engineer Clement, of Vancouver, has received from Waddell & Harrington their estimate of the full cost of the new Cambie Street bridge. The sum is fixed at $763,500 not including land damages.

For special steel track in connection with Ross Street subway, St. Thomas, the following tenders were received: Montreal Steel Works, (f.o.b. Montreal), $1,447; Nova Scotia Steel Corporation, $1,485; Dawson & Company, Montreal, $1,559.

The G.T.P. has awarded contracts for six steel bridges on the hundred mile section east of Prince Rupert to the Canadian Bridge Company, Walkerville, Ont., for $400,000. Contractor Ferguson will do the concrete foundations. The company also announced that steel laying begins in September out of Prince Rupert.

The Canadian Bridge Co., Walkerville, Ont., has been awarded the contract for the construction of six steel bridges on the 100 mile section of the Grand Trunk Pacific between Prince Rupert and Kitsalas canyon on the Skeena river. The total amount involved is between $350,000 and $400,000.

The Winnipeg civic works committee have instructed the city engineer to prepare plans for a new superstructure for Louise bridge and Main street bridge. They have also instructed him to submit the plans already made for the Brown and Brant overhead bridge, which were approved by the Railway Commission. It is stated that the plans of the overhead bridge will be carried out. The estimated cost of the structure, according to this design, is $229,000.

Planing Mill News.

Friedman Bros., Montreal, will build an up-to-date planing factory.

The lumber mill of B. W. Titus, at Upham, N.B., was recently destroyed by fire.

The Rainy Lake Lumber Co. will this fall erect a large sawmill with a capacity of 100,000,000 feet per annum at Fort Frances, Ont.

The headquarters of the Crescent Lumber Co., which recently took over the Moose Jaw Lumber and Supply Co., will be located in Moose Jaw. The company have five yards at present, and expect to be operating in the neighborhood of twelve to fifteen yards before fall.

Trade Notes.

The Waterous Engine Co., Brantford, is supplying the machinery for the Mundy Lumber Co.'s mill at Three Valley, B.C.

Kilmer, Pullen & Burnham, Toronto, have been incorporated with a capital of $40,000 to manufacture electrical machinery.

The Smart-Turner Machine Co., Ltd., Hamilton have supplied W. A. McGowan, Durham, with one of their Centrifugal pumps.

John Taylor & Co., Toronto, have ordered a Duplex Pump from the Smart-Turner Machine Co., Limited, Hamilton, Ont.

The Corbet Foundry and Machine Co., Owen Sound, were the successful tenderers for the contract of building a county line bridge near Dundalk.

A representative of Dodge Mfg. Co. reports having recently booked contracts for over six hundred tons of machinery, chiefly grain elevator equipment, for the large terminal houses now building.

The Dominion Foundry Equipment Co., Montreal and Toronto, have supplied a Whiting traveling crane to E. A. Wallberg, for his plant at Matabitchouan, Que., and a six ton cupola to the Lee Mfg. Co., Peterboro.

The Hill Electric Switch & Mfg. Co., 1560 St. Lawrence Boulevard, Montreal, have supplied the Montreal Harbor Commissioners' Elevator, Montreal, with panelboards.

The Parkin Elevator Co., Hespeler, recently booked over $6,000 of orders, and the Hespeler Machinery Co. lately booked a hurry-up order for 17 machines for Fort William.

The Ontario Iron & Steel Co. has just cast a steel flywheel weighing 40,000 pounds, for the Allis-Chalmers Co. It is said to be the largest casting of its kind ever made in Ontario.

The tender of the Robb Engine Co., of Amherst, N.S., for a 750 horse power compound Corliss engine for Saskatoon's electric light and power plant at $16,145, was accepted. A 500 k. w. generator was purchased from Allis-Chalmers-Bullock Co., Montreal, for $6,860.

The Toronto Board of Control have awarded to the Canada Foundry Co., the contract for supplying 12 and 15-inch penstocks for $29.84 and $35.02, and to the John Inglis Company the contract for the 18 and 24-inch penstocks at $43.75 and $57.65. The penstocks are for the high level interception sewer.

J. W. Williamson, Montreal, has about completed arrangements for making Hendry's Patent Laminated Belting in Canada and so supply the Canadian trade from this side. This step will enable prompt shipments to be made. Previously this belting has been supplied direct by the original maker James Hendry, Glasgow, Scotland.

Contracts were recently awarded in connection with improvements to the Peterboro Waterworks. The contract for the new concrete dam, pump house foundations, wheel pits, etc., was awarded to the Bishop Construction Company, of Montreal. The price was by quantities. The

contract for one unit of pumps of 3,000,000 gallons capacity, with turbine, was awarded to the Wm. Hamilton Co., Peterborough, the price being $12,900.

General Manufacturing Notes.

The Postum Cereal Co. will erect a $10,000 plant at Windsor.

The Acheson Graphite Co. will enlarge their plant at Niagara Falls.

The Alberta Pacific Co. will enlarge their elevator at Red Deer, Alta.

O. H. Waug, Sons & Co., Buffalo, will erect a factory at Port Arthur.

The Edwards Mfg. Co., Toronto, are erecting a new building to cost $7,000.

The Imperial Extract Co., Toronto, will erect a new factory to cost $18,000.

The Aberdeen Flour Mills, will erect a mill to cost $25,000 at Humbolt, Sask.

The Imperial Vacuum Machinery Co. is to establish a factory at Brantford.

O. K. Wilson secured the contract to build a 30,000 bushel elevator at Corinne, Sask.

The J. Y. Griffin Co. will spend $20,000 in extending and enlarging their premises at Nelson.

A wagon factory may be established at Port Arthur if the city guarantees an issue of bonds.

The erection of a large spice mill and warehouse is planned by G. F. and J. Galt, at Winnipeg.

The Victoria city engineer's department is preparing plans for a new incinerator to cost about $2,000.

Kelowna, B.C., has secured a new industry, in the shape of a factory for the manufacture of wooden pipe.

A glue factory may be established at Port Saxon, N.S., by Dr. James H. Melanson, Gloucester, N.S.

The Kinistino, Sask., Milling & Elevator Co. have secured a mill site and will at once start building operations.

The Borland Carriage Co., Stratford, will be reorganized as the Stratford Carriage & Motor Co., with $100,000 capital.

The Williams, Greene & Rome Co., shirt manufacturers, Berlin, will probably build a $6,000 branch factory at Hanover.

The Imperial Elevator Co. will put up an elevator at Carstairs, Alta. The Alberta Grain Co. will also erect an elevator.

The Western Milling Co., Calgary, will rebuild their elevator destroyed by fire a few months ago. The estimated cost is $12,000.

A. E. Smith, Reading, Mich., is negotiating with the Winnipeg city council with a view to establishing a new tanning and manufacturing plant.

Campbellford ratepayers have approved a by-law to give the Northumberland Pulp Co. a fixed assessment of $3,000 for ten years on a pulp mill to cost $10,000.

Frederick Harcourt, managing director of the Loose Leaf Ledger Co., is negotiating with the Fredericton, N.B., Board of Trade with a view to establishing a factory in that city.

J. H. Sutherland, J. R. Sutherland and John S. Blanchard have formed the United Glass Mfg. Co., and will erect a big glass factory and warehouse adjoining the G.T.P. shops at Winnipeg.

The B.C. Electric Railway are enlarging their present power house at Victoria and are calling for tenders for excavating for and building of concrete foundations for steam engines and boilers.

Definite announcement has been made that the new Ogilvie elevator at Fort William will be commenced immediately. It will be of 500,000 bushels capacity and built close to the present elevator.

Cook & Vanstone intend to expend $35,000 on the erection of a flour mill and a thirty thousand bushel elevator at Regina, as well as making provision for ample extension of the enterprise should it justify the outlay.

The American Shipbuilding Co. have been having some negotiations with Port Arthur regarding a proposition to build a dry dock at that place, and a by-law will be voted on by the people of Port Arthur on August 10.

Another new proposition is the erection of a mill for the manufacture of black powder at Ruskin by the Giant Powder Co. Ruskin is located 30 miles from Vancouver on the main line of the C.P.R., on the Fraser river. This concern already has a dynamite plant at Telegraph Bay, near Victoria, on Vancouver Island. C. C. Bemis, of San Francisco, president of the company, has been here in connection with the matter, and now that the site has been secured, he says that work on the plant will be started without delay. The total investment will be $60,000. As the product is used mostly in clearing timbered land, there is a market all about.

Gas Items.

The Gas Engine & Traction Co., Winnipeg, will erect a large factory at Elmwood.

The Brooks Gasolene Engine Co.'s plant at Niagara Falls was totally destroyed by fire early in July.

The by-law to give the Provincial Natural Gas Co. the right to pipe the town of Welland was endorsed by the electors recently by a large and almost unanimous vote.

The Monitor Mfg. Co., Fredericton, have made a large shipment of Acetylene Generators to Berwick, N.S., where they are installing among others, a lighting plant for Dr. Geo. McNally.

The Colonial Engineering Co., Montreal, have received a contract from C. S. Hyman & Co., London, for 275 h.p. Hornsby-Stockport gas engines. The Colonial Engineering Co. agree to furnish the power at $18.80 per h.p. a year.

The Montreal Fire and Light Committee have received an offer from the Colonial Engineering Company to erect a gas engine generating plant for the electri lighting of the city for a sum not exceeding $250,000, exclusive of the cost of the site.

Sarnia ratepayers voted for the extension of the gas franchise to the Sarnia Gas and Electric Light Co. for twenty years. The Sarnia Gas Co. have a contract to pipe gas from the Tilbury field and sell it for fourteen cents per thousand feet for manufacturing purposes and thirty cents for domestic use.

The contract for the construction of a tank and pumping station at the Blenheim electric light power house was awarded to J. H. Collier and D. H. Gray. Cunis & McIntyre will instal an International Harvester gas engine cap. able of lifting 2,000 gallons per hour. Engine pump, etc., complete costing $173.

Electricity and Steam.

Tenders will be received by the City of Toronto, Canada, until noon of June 30th, 1909, for laying between 350,000 and 450,000 duct feet of underground conduit. For specifications, form of tender, etc., apply Electrical Department, City Hall.

Tenders will be received until 8 p.m., June 21, by O. T. Springer, City Secretary, Burlington, Ont., for the following work: Contract B—pump house; Contract G—electrically operated pumping machinery; Contract I—steel pump well. Willis Chipman, C.E., Chief Engineer, 103 Bay St., Toronto, Ont.

Tenders will be received for electrical machinery, until 5 p.m., June 22, by J. H. Trusdale, City Clerk, Saskatoon, Sask., for the following: (A)—500 K. W. 2,200 volts, 60-cycle, 150 R. P. M., 2-phase, generator, exciter, and switch board, installed, complete. (B)—750H. P. 150 R.P.M. vertical, cross-compound Corliss engine, with the necessary condensing apparatus, installed complete. Plans and specifications may be seen at the office of the Electrical Superintendent, E. L. White, Chubb Block.

New Companies.

The American Laundry Machinery Company, Toronto, has been chartered with $40,000 capital. B. N. Davis, Toronto, is one of the promoters.

The Imperial Vacuum Machinery Co. has been organized with headquarters at Brantford. Capital is $40,000 and M. Ungar, J. Ker and A. Goodwin, directors.

The Consumers Cordage Company, Montreal, have been granted a license to do business in Ontario with the Colonial Cordage Company, Toronto, as agents.

Hew R. Wood, Ltd., Toronto; capital, $40,000; to manufacture and deal in machinery. Incorporators, C. R. Allison, H. J. Welch and C. R. Howard, Toronto.

Canadian May-Oatway Fire Alarms, Limited, Winnipeg, capital $100,000, to manufacture automatic fire alarms. Directors: W. Sanford Evans, W. A. Black, and M. Bull, Winnipeg.

The Welland Glass Manufacturing Company, Welland, Ont., has been granted a charter with a capitalization of $350,000. E. A. Fultz, Cleveland, and B. J. McCormack, Welland, are directors.

Advance Power Co., Toronto; capital, $200,000; to manufacture gas and steam engines, boilers, machinery, yachts, automobiles, etc. Incorporators R. E. Clisdell, Anna E. Clisdell and A. W. Holmsted, Toronto.

The Oro Telephone Co., Hawkestone, Ont., capital, $20,000; to carry on telephone business in Vespra, Oro and Medonte townships, Simcoe county. Incorporators, R. W. Metcalf, Geo. Raikes, and Geo. Crawford, Oro.

Wolford Rural Telephone Co., Easton's Corners, Ont.; capital, $10,000; to carry on telephone business in Wolford township, Grenville Co. Incorporators, W. H. Watts, J. B. Arnold and Wm. Hughes, Wolford township.

Manitoba's Resources to be Developed.

The mineral resources of Riding Mountain, Manitoba, are about to be developed by a syndicate which has purchased the mineral rights of many of the settlers. Samples taken at a depth of 300 feet have been reported on favorably by the head office of the syndicate and it is the intention to sink a shaft 1,000 feet when it is confidently expected that oil and coal in paying quantities will be found.

Factory Products Limited

Mr. H. C. Nicholls, who has for several years been Assistant General Manager of the Canadian General Electric Company and the Canada Foundry Company, has resigned that position in order to go into business for himself. He has organized a company called "Factory Products Limited," with offices in the Confederation Life Building, Toronto, for the purpose of acting as Canadian Selling Agents for representative manufacturers.

A Handsome Catalogue.

The Hamilton Facing Mill Co., Hamilton, have issued complete catalogue No. 6 of their "Made in Canada" foundry facings, supplies and equipment. The catalogue consists of 176 pages on coated paper, describing fully the lines handled, consisting of several grades of plumbago, foundry facings, core oil, molding sand, crayons, brushes, flasks, chaplets, rammers, wheelbarrows, molders' small tools, ladles of several descriptions, cupolas, firebrick, melting furnaces, blowers, core ovens, molding presses, sand sifters, firebrick, tumbling barrels, etc. Prices are given for the greater number of this equipment so that the volume is a valuable one for any manufacturer to have on hand for reference.

"Rival" Engines Change Hands.

J. T. Schell has now a complete chain of agencies extending from Halifax to Vancouver.

J. T. Schell, Alexandria, Ontario, has acquired the right from the Laurie Engine Co., to manufacture their line of "Rival" horizontal engines.

Work will be begun at once on the small sizes 15, 20, 27 horse power, but later on their machine shop and foundry at Alexandria will be extended to enable the larger sizes to be built.

These engines will be remodelled somewhat and will embody several well defined improvements and together with the "Auto-Climax" engines of 5 and 10 horse power will make a very complete line.

Monster Power Co. for Manitoba.

Small supplies of power from 100 h.p. up will be delivered at the rate of $20 per h.p., measured at the plant, while for amounts of from 5,000 to 10,000 h.p. the charge will be $15. The charge for transmission will be 3½ cents per mile. Brandon is 225 miles from the plant, which will bring the rate for 6,000 h.p. up to $22.87½, delivered at the high tension station here.

The Byllesby company has 12 plants in operation in the United States, and is considered one of the strongest engineering firms in America. Their idea is to supply power for manufacturing and municipal purposes throughout the whole of the province, the modern improvements in transmitting high tension currents making this possible.

More complete details of the monster power project being planned for Manitoba have been given out. It is claimed by the Byllesby company that they can develop 150,000 electrical horse power at their site at Great Falls, at the lowest initial cost of any electric hydraulic plant of similar size on the continent, though

it is not proposed to undertake the full development at the present time. The plan of operation is that the company will close contracts for the delivery of 20,000 horse power and as soon as these are made construction work will be begun. At the present time they have contracts for 17,500 horse power in different parts of the province, and construction work will be started in the immediate future, or as soon as 20,000 horse power is contracted for.

Large Gas Engine.

The Dominion L. H. P. Company have already purchased a suitable plot of ground in Maisonneuve for the erection of the new plant, and are at present in consultation with their architects over the plans. Work will be commenced very shortly on building the power house. The site cannot at present be divulged.

A contract for a large gas engine has been placed with the Colonial Engineering Co., 222 St. James Street, Montreal. This company has contracted with the Dominion Light, Heat & Power Co. to furnish 1,000 h.p. Hornsby-Stockport gas engine for the purpose of public and private lighting and the sale of current for power.

The equipment will consist of three 250 h.p. Twin Cylinder Hornsby-Stockport gas engine units, and two 125 h.p. units. The station will be the most modern one of the kind in the Dominion, if not on the continent—the building to be of concrete construction throughout, and 3-phase, 60-cycle alternating current will be developed. This plant is to be in operation by December next. Anthracite pea coal, coke or charcoal will be the available fuels.

The Burridge-Cooper Co., Winnipeg, have been awarded the contract for the waterworks system at Estevan, Sask. The contract consists of one 500 horse power gasolene engine and one 10 horse power gasoline engine, one double acting triplex power pump, capacity 6,000 gallons per minute, and a quantity of high pressure piping. The contract price is in the neighborhood of $50,000.

The Waterloo Manufacturing Co., Waterloo, Ont., shipped a trainload of threshing machinery to their new western quarters in Portage la Prairie. The shipment passed through Winnipeg on July 23. This is the first trainload of machinery forwarded from Waterloo, and it is likely to be followed by other shipments in the near future, as the demand in the west is increasing. The shipment weighed 350,000 pounds, and was valued at $100,000.

The Canadian Westinghouse was much in evidence in the manufacturers' exhibits. Besides exhibiting a number of appliances for electrical equipment in the city of Winnipeg booth, they had an attractive booth of their own in which they had on exhibition a number of articles manufactured especially for household use. Particularly noticeable were electric tailors' irons, sewing machine motors, electric motor drivers, vacuum cleaner machine and electric radiators. The booth was lighted by means of the Nernst lamp, for which they are agents.

The Ontario Wind Engine and Pump Co., Toronto, had one of the best exhibits of gasoline engines. A 1½ h.p. Stickney engine was operating a pump, while a 16 h.p. Stickney was operating a threshing outfit. They also showed 30 and 40 h.p. gasoline traction engines called the "Flower City." These were the engines that captured the gold medal last year. They were also showing a line of well-drilling machinery, grain grinders, wood saws, pumps and scales.

One of the first plants that will open in Winnipeg when power and labor will permit, will be a steel casting and malleable plant. There are no steel casts or malleables made in western Canada, and the great volume of shipments of these lines from Ontario foundries would warrant the opening of a plant here as soon as possible. Carloads of castings from various Ontario foundries enter here monthly for the supply of such goods as those required for the several fence companies and the Great West Saddlery Co.

The model was about 15' x 12' and gave a splendid idea of the appearance of Winnipeg river, where the power is derived. In miniature there was a waterfall of 45 feet which is fully taken advantage of by a station. Accompanying literature explained that the first unit of power delivered in Winnipeg will be 17,000 horse power, which will cost $18 at the city sub-station. Eventually there will be 65,000 horse power developed. Nothing has yet been done in Winnipeg, in spite of all the publicity which the Point du Bois development plan has received to bring home to the minds of the citizens, as this did, the great project in which Winnipeg is engaged.

Local machine supply firms look forward to the time when Winnipeg will become known as a manufacturing centre. The great drawback in the past has been chiefly that of labor and high priced power. The labor question is not so serious as it was a few years ago, with the influx of laborers to the west, and the gradual diminishing of laborers in eastern Canada, the wages paid in the west and the east do not vary so much as a few years ago. Consequently old manufacturers in Ontario and Quebec find the same difficulties as employers in the west. In the east labor is high because it is scarce; in the west labor is high on account of economical conditions.

Until manufacturing develops there will be a weak market for small machine tools. In this line the trade is not so strong as it was a few years ago. Several attempts were made about three or four years ago to work up a machine shop business, but few of them have had great success. The result is that there are few of the smaller machine tools moving at present. It must be admitted, however, that if the managers of the smaller machine shops were content to make legitimate profits on their products, the machine trade would not be so low. A western manufacturer is not satisfied with such small profits as are enjoyed by eastern manufacturers. Competition in the east has compelled manufacturers to reduce their prices, and in time the same thing will result in Winnipeg.

There were several splendid exhibits of machinery and display at the Winnipeg Industrial Exhibition held from July 10 to 17. The main display in the central manufacturers' building was that of the city, an exhibit planned in part by the industrial bureau, and partly by the electrical department of the city hall. It was designed to educate visitors and the citizens of Winnipeg in the uses to which electricity may

Canadian Machine Tool Markets

HALIFAX.

The Dominion Steel Co.'s proposed expansion at its plant will give employment to a large number of men, and as a result business should naturally benefit thereby. The expenditure of several million dollars on construction work is hailed with delight by the business men of Sydney, C.B., the "Pittsburg of Canada," and a renewal of the boom times of several years ago is predicted. In addition to this everything is bright and prosperous at the collieries. The shipments of coal are very heavy so far this season, and they will likely continue until the close of navigation. There is a large amount of building operations going on in the mining towns of Cape Breton and the Dominion Coal Co. recently awarded a contract to the Rhodes, Curry Co., of Amherst, for the construction of thirty cottages for the miners. The construction of these is to be proceeded with at once. Many fine private residences are also in the course of erection, and others are being contracted for. Barring labor troubles, everything gives promise of a banner year in the mining districts of Cape Breton.

MONTREAL.

Metal working tools are enjoying a steady demand and compared with this time last year, an increased business of about twenty per cent. is being done.

Orders are coming in with satisfying steadiness and inquiries have more to them than the earmarks of curiosity. Wood-working machinery is very active, which is rather to be expected at this time of the year when saw and planing mills are at their busiest, supplying the building trades.

The summer months have abundantly proved the fact that the return to old normal conditions—and better—of the machinery trade is assured. Usually this time of the year with its attendant holidays and hot weather results in the slackening of business in machinery lines but this last month's buying has not felt these effects to any appreciable extent.

The foundries are nearly all working full force, full time now, mostly on contract work, but small separate orders are numerous. The demand for cast iron pipe is heavy. This is due to the summer undertakings of municipalities which are extending water systems, etc. The demand for railway castings is not as brisk as was anticipated earlier in the spring but shows evidence of increasing.

The dealers in automobile supplies are very busy which is but to be expected at this time of the year. This draws attention to the increased number of garages and automobile repair shops. Although these are not, individually, buyers of heavy machinery not machinery in large quantities, nevertheless the aggregate of their orders is such to make them a serious consideration in the machine tool trade.

Underlying all this increased activity and optimism on the part of the dealers, is the condition of the money market. The recovery from the "recent depression" has been so rapid during the last three months that imports and exports into and from this district are now close to the record mark set in the summer of 1907. There is a plentitude of available money and loans are being negotiated at very low interest which are being used to further industrial extensions.

Among the lines most active on the power development side of the fence is the apparatus tending to economies in power generation such as steam traps, regulators and forced and induced draft appliances. These latter are particularly noticeable. The reason for this seems to be the fact that manufacturers, having reorganized shop conditions to meet existing close competition, are now turning their attention to economies in the power development end, with the view of further reducing costs and overhead charges.

TORONTO.

Reports from New York, Cleveland, Cincinnati and Milwaukee are very encouraging. Machinists are being taken on, following the increased demand for machine tools.

Canadian companies are busy and though there were fewer orders placed during the first part of July than in June, inquiries kept up and some good orders are now being placed.

An addition to Toronto's foundries will soon be made when the National Iron Works will erect a plant in the east end. This is controlled by Hon. William Mulock and Cawthra Mulock.

The grey iron and brass foundries are busy with orders showing that the smaller machine shops and also the larger ones without their own foundries are busy. Some of the foundries are working to their capacity.

Power lines are in demand and Canadian companies are very busy. One Galt company received one order for two engines and seven boilers from British Columbia totalling $30,000. This is a sample of the demand for power machinery.

Both Canada and United States are seeing the steel industry improve week by week. The Canadian industries in Nova Scotia and Ontario are enlarging and prospects are very bright. Canada has entered the export trade of steel rails and having an industry nearer the sea than Pittsburg, should become a prominent factor in the foreign steel rail trade.

The conditions existing in the United States point towards an advance in the price of machine tools made across the border. During the depression the efficiency of machine tools has been greatly developed so that the capacity of some of the machines now being placed on the market has a capacity of double and treble that of less modern types, so that the rise in price will be offset in the increase in efficiency of the machines.

WINNIPEG.

Regarding the price of power, it is only a matter of two years or less when much cheaper power will be available. The new city plant now under construction will have a capacity of 65,000 horse-power, which will be put on the market at a very low figure.

The supply trade is also weak as is expected from the nature of the machine shop business. Blacksmiths' supplies are in fair demand throughout the west. The heavy machine tool business is all that could be expected. The extensive building, railway construction and mining that is now in progress, calls for a large amount of the heavier machinery.

Saw milling machinery is also in considerable demand. A local supply house recently shipped a derrick iron and hoisting engine to Calgary for construction work.

be put. It was chiefly designed to interest the public in the cheap power which will be at their disposal upon the completion of the plant two years hence. F. A. Cambridge, city electrician, set up the exhibit and it was interesting not only for its educative value but for its attractiveness. In addition to the electrical display there was a model of the civic power plant as Point du Bois, 75 miles from Winnipeg.

The exhibit of the Stuart Machinery Company greatly eclipsed the efforts of previous years. This year trouble was taken to show the public the different uses to which machines could be put. In the centre of the display was a large planer and matcher operated by an electric motor. Other wood-working machines such as band saws, rip saws, sash stickers, moulders, etc., were shown to good advantage. This firm is showing its confidence in western Canada by removing the present building at 766 Main Street, back to Queen Street, with the intention of erecting a building four storeys in height with all the modern conveniences necessary to the handling of machinery on a large scale. This is indicative of the material progress being made in all branches of the machinery industry, and probably the astounding increase of prosperity in western Canada is to a large extent indebted to the manufacturers of machinery.

CATALOGUES.

DROP FORGINGS—J. H. Williams & Co., 150 Hamilton Ave., Brooklyn, N.Y., manufacturers of drop forgings, have issued a fine 120 page catalogue, a striking feature of which is the front cover design of a red-hot facsimile of a drop forged wrench. On page 7 of the book mention is made of the new lines made by the company, these, including amongst others the "Vulcan" bijaw chain pipe wrenches and the "Agrippa" fittings chain wrenches. A numerical index on page 8 is also very convenient and a special talk on steel specifications is given on pages 107 to 110. In addition to the large edition of these catalogues, a separate edition of pocket size will be printed for distribution among employes of workshops, etc.

MOTORS—The Westinghouse Electric & Mfg. Co., Pittsburg, Pa., has issued a handsomely printed little booklet describing the applications of its line of small motors to office, store and shop services. The numerous illustrations scattered through the pages suggest many time and labor saving uses for these efficient little power devices; among these are the motor-driven adding machine, mailing machine, envelope sealer, buffing and polishing wheel, blower, hand drill, hack saw, etc., applications selected at random from the large number mentioned.

BOOK REVIEWS.

COPPER HANDBOOK—The eightg annual edition of the Copper Handbook, just issued by the author, Horace J. Stevens, of Houghton, Mich., is at hand.

The principal chapter of the book, devoted to detailed descriptions of the copper mines of the globe, describes no less than 6,767 copper mines and copper companies, in all parts of the world. This long chapter has been completely rewritten.

Rarely is a single work found of such general importance to such a great diversity of interests as is the Copper Handbook, which is practically an encyclopedia of the entire subject of copper, and, as such, is of equal interest to miner, metallurgist, refiner, producer and consumer. To the investor or speculator in copper shares, it is as nearly indispensable as a work of reference can become.

The Copper Handbook is exceedingly frank in its comments, and the descriptions of mining companies considered by the author to be dishonest, are marked by the utmost limit of plain-speaking. That seven preceding editions, embodying language of the same tartness, have appeared without a single libel suit being brought into court, though many going companies are branded as swindles, is evidence that Mr. Stevens, notwithstanding the fact that he denounces several hundred companies as frauds, is sure of his ground in making such scathing arraignments as are contained in this and the past editions of his book. The price of the Copper Handbook is $5 and the publisher prepays carrying charges, allowing the purchaser a week's inspection.

ANNUAL REPORT OF THE MINISTER OF MINES of British Columbia for the year ending 31st December, 1908, being an account of mining operations for gold, coal, etc., in the Province. William Fleet Robertson, Provincial Mineralogist (British Columbia Bureau of Mines.) 271 p., plates, maps, 1908.

New Shops of "The People's Railway" at Moncton, N.B.

A General Description of the New I.C.R. Shops, Showing the Arrangement and Construction of the Buildings—Equipment—The Largest Single Unit Gas Engines in Canada.

An almost level plateau, on the main line of the Intercolonial Railway to Montreal, about a mile from Moncton, was the site chosen on which to erect these fine new shops of "The People's Road." The soil is admirably suited to building purposes being a firm dry clay. Having lots of land at their disposal the designers have allowed plenty of room to each building with ample provisions for extension.

Fig. 1. View of Part of the I. C. R. Yards, the Old Shops and the City of Moncton. The Large Brick Building on the left is the I. C. R. General Office.

A glance at Fig. 2 will show the way the different shops are laid out, and the excellent track facilities. Two main sidings are fed by numerous branches all having easy access to the various shops. All the buildings are laid out parallel to the main line with the exception of the passenger car repair and paint shops, and the main machine shop.

Industrial narrow gauge railways run on the standard tracks' sleepers and numerous turntables throughout the plant greatly facilitate the handling of material. The turntables were furnished by the Whiting Foundry Equipment Co. through their Canadian agents, The Dominion Foundry Supply Co. Ltd. Part of this turntable equipment is, where needed, heavy enough to sustain the heaviest locomotives and are supported on chilled rollers traveling on turned tracks.

The driving equipment for the machines consists of upwards of 210 motors, both alternating and direct current. These are of various makes including Allis-Chalmers-Bullock, Westinghouse, and Canadian General Electric. The English machines are in some instances equipped with English motors. The heavy machines are all individually driven and the lighter ones are arranged in groups. Fig. 2 gives the exact layout of all the various machines.

Fig. 3 is the exterior of the planing mill showing the reinforced concrete construction typical in all buildings, although the shops and interiors are, of course, laid out to suit the work for which they are intended. The buildings are all well lighted and the fact that the interiors, with the exception of the exposed steel work, are all sprayed with a white cold water paint adds materially to this most important feature in modern shop design—light. The steel work is painted a dull red and windows and doors have a light drab covering.

Planing Mill.

The planing mill is a one storey building 81 ft. 10" x 202 ft. 8" with a small heater room at the east end There are twenty-eight machines in this shop, nine of which are individually driven. The rest are divided into groups. In the equipment are ten machines from the Fay & Egan company including a planer and matcher, the large dimension planer shown along the north wall, automatic cut off saws, tenoners, etc. The McGregor-Gourlay company have provided four machines, including two planer and matchers and a band re-saw. Other machines include a surfacer by S. A. Woods, a variety woodworker by Greenlee Bros., a Berlin machine works double cut-off saw and a 48" grindstone by the Oliver Machine Co. A standard gauge track runs right through the mill with industrial tracks down the centre.

Freight Car Repair Shop.

Fig. 4 shows the interior of the freight car repair shop. This building is 134 ft. 8" x 362 ft. It is divided into three bays, each 44 ft. wide, by

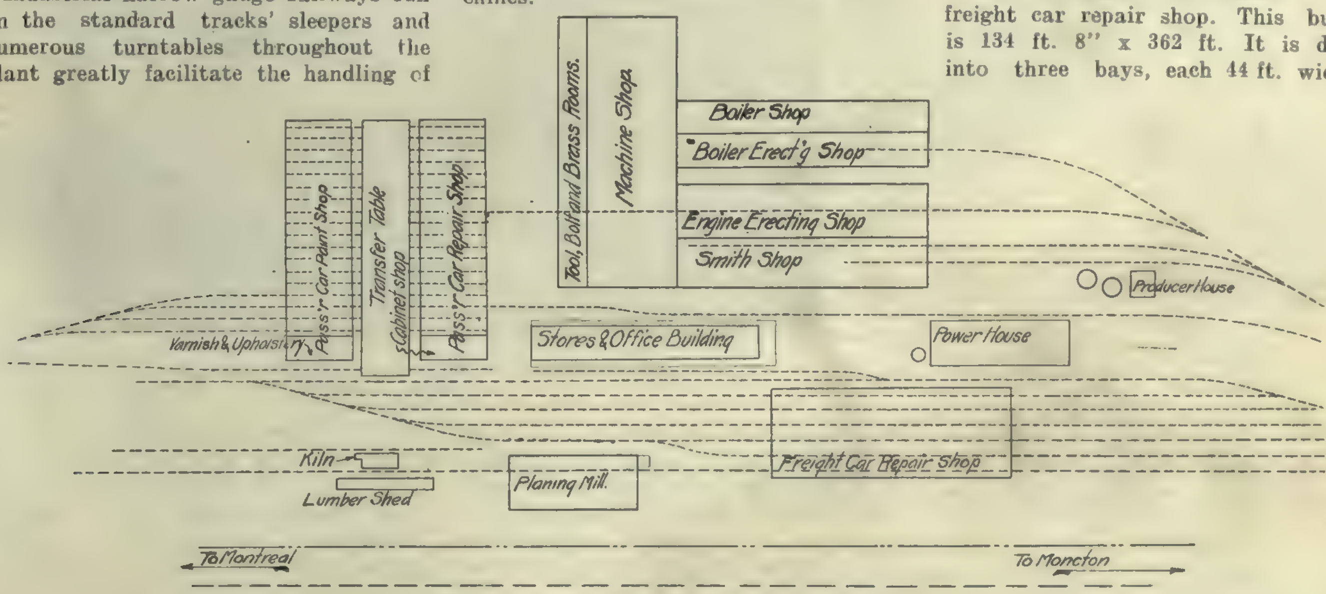


Fig. 2.—Layout of I C. R. Shops at Moncton.

two rows of columns and each bay is served with two rows of tracks extending through the building providing accommodation for about fifty cars. The construction is all steel and reinforced concrete and is as absolutely fireproof as is possible to make it. The pilasters are on 20 ft. centres and the space between is completely glazed with the exception of a strip about two feet in width.

Figf 3.—Exterior of Planing Mill. This Style of Reinforced Concrete is Typical of all the Shops.

Passenger Car Repair and Paint Shop.

These two buildings are identically alike in construction and are each 361 ft. 8" x 100 ft. and are built entirely of reinforced concrete. At the south end of the paint shop are the upholstery and paint mixing departments. In the former is a motor driven single sweeper vacuum cleaner (Canadian Vacuum Cleaner Co.) and a Dutton hair picking machine.

The cabinet shop is at the south end of the passenger car repair shop. All the machines in this department are individually driven with the exception of the grinders and trimmers which are grouped. There are thirty-four machines here including a Goldie & McCulloch universal wood worker, eleven McGregor-Gourlay wood working machines for different purposes, a Fay & Egan 1½ inch hollow chisel mortiser with boring attachment, band saw and mortiser from Cowan & Co., an Eaton, Cole & Burnham pipe threader, and several machines from the Oliver Machinery Co. The lacquering department is at the north end of the shop.

Parallel tracks run between the columns and between the two shops is a transfer table (Fig. 7) which facilitates the movement of cars from any track in one shop to any track in the other. Since the construction of both shops is identical, Fig. 5, which is a photo of the interior of the paint shop may also be taken as one of the repair shop. There are four rows of reinforced concrete columns, 20 feet between centres of rows and 18 feet between centres of columns in the rows. Each column is 14 inches square and they are used for the supports of the adjustable platforms as shown in Fig. 6. The arms of these platforms slide vertically on pipes and are held in place, after being brought to the required position, by a pin inserted in holes drilled in the pipe. They reach to within easy distance of the side of a passenger car and greatly facilitate the work of repairing or painting. These buildings are directly connected to the locomotive erecting shop by a track through the machine shop. This will be used to run an engine into the paint shop if the erecting department is crowded. In Fig. 6 may be seen construction of the doors. These are counter-balanced and slide vertically. Each door is in three sections connected by a pantograph arrangement of iron bars and are easily raised and lowered.

The Machine Shop.

This is the largest of the buildings being 131 ft. 6 inches x 408 ft. with an annex 44 ft. x 408 ft. As seen in Fig. 8 the main building is divided into two bays each served with a Babcock and Wilcox electric traveling crane of ten tons capacity. The building is of structural steel and the roof of reinforced concrete similar to the other shops. The floor is of 2 inch hemlock plank nailed to 3"x3" strips on a bed of concrete. Light, the all important adjunct to good work and a healthy shop, is abundantly supplied. The sides are practically all glass and the skylights are large and numerous.

The smaller machines are ranged in groups along the centre columns and at one side, each group having its own motor. The heavy machines are mostly in the bay next the locomotive and smith shops, being driven by individual motors.

In the south end of the annex is the nut and bolt department. In this shop the tools are all grouped. There are twelve machines from the Acme Manufacturing Co. consisting of nut tappers and bolt cutters. There are four turret machines, one from each of the following concerns: Jones & Lamson, Warner & Swasey, Cleveland Automatic Machine Co., and Smith & Coventry. Other machines include a four spindle Lassiter stay bolt machine (Foster & Co.), two bolt lathes from the London Machine Tool Co., a Hendry 16 inch lathe and a 20 inch lathe from John Bertram & Sons.

North of the bolt department is a small testing laboratory. The machines here consist of a Pratt & Whitney 10 inch lathe, a stay bolt vibrator, a spring tester and an Olsen tension and compression machine. These are all group driven. The brake department comes next and then the tool and tool

Fig. 4.—Interior of Freight Car Repair Shop.

grinding rooms, and along further is the brass and tool departments. With the exception of a J. Bertram & Sons 30 inch drill, all the tools in these departments are in groups. In the brass working department there are no two tools by the same maker with the exception of four machines from J. Bertram & Sons and two from Wood, Light & Co. Among the others is a 14 inch lathe from R. K. Leblond, lathes from Hendry Machine Co., J. Whitworth & Co., Smith & Coventry, American Machine & Tool Co., etc. Brown & Sharpe are represented by one of their No. 4 millers.

In the tool department are five Pratt & Whitney tool-maker's lathes, Brown & Sharpe's grinders and millers, Alfred Herbert & Co.'s sensitive drill, a centreing machine from the D. E. Whiton Machine Co., a car brass borer from J. Bertram & Sons, a Wm. Sellars & Co. lathe and others. The brass foundry is at the north end of the annex, convenient to the brass department. The tin, copper and lagging department is at the north end of the main bay. The Niagara Machine & Tool Works have supplied five out of the seven machines for work here. These, consisting of shears and rolls are all individually driven.

The plant being, at present but an erecting and repair plant the pattern shop is necessarily not extensive. This department is at the north end of the machine shop, on the east side. The Oliver Machine Co. have supplied the majority of tools in this shop, the remainder, representing Fay & Egan, Fox Machine Co., H. B. Smith Machine Co. and the Sussex Manufacturing Co.

Fig. 5.—Interior of Passenger Car Repair Shop.

Main Machine Equipment.

There are upwards of 125 different machines in the general machine shop. A large majority of these are driven each with its own individual motor. Where convenient, the smaller machines are divided into groups. The heavy machines for working on tires and wheels are ranged along the east wall near the erecting shop. The majority of these were supplied by J. Bertram & Sons, including the 100 inch wheel lathe with its 50 h.p. motor. The London Machine Tool Co. have one of their driving wheel journal lathes in this department as well as a 72"x72"x25 ft. planer in the frame and cylinder department. Among the other makers represented are W. Sellars & Co., double car axle lathe, motor driven; Pratt & Whitney lathes and centreing machine; R. D. Wood, hydraulic wheel press; Brown & Sharpe, milling machines; McGregor, Gourlay & Co., lathes; R. K. Leblond, lathe; Binse Machine Co., Smith & Coventry, Henry & Wright.

The Chapman Double Ball Bearing Co., Toronto, have supplied double ball bearings for the complete line shafting in both planing mill and machine shop. The equipment for the former has been running since July, 1907, while the latter equipment including fifty-nine 2 3-16 inch and fifteen 1 15-16 inch bearings are now being installed.

The Blacksmith Shop.

This building is at right angles to the machine shop and is of the same construction. It is 375 ft. x 76 ft. 8 inches, and is served with jib cranes only. There are 25 of these which were supplied by the Whiting Foundry Equipment Co., through the Dominion Foundry Supply Co. There are 12 of 1,000 pounds capacity, mounted on rigid posts and serving the forge fires and forging machines. Five jib cranes of 3,000 pounds capacity, three of 4,000 pounds, four of 6,000 pounds, and one of six tons capacity. These heavy cranes are used with the steam hammers and have hand power gearing. There is also a special spring attachment to absorb shocks from the steam hammers. The cranes all have frames of structural steel sections. The shop is still further served by a standard gauge track the whole length of the shop as well as cross tracks through to the erecting and boiler shops.

Fig. 6.—Adjustable Platforms in Passenger Car Repair Shop.

Blacksmith Shop Equipment.

The heaviest tool in this shop is a double frame Bement steam hammer of 4,000 pounds capacity. There are five

single frame steam hammers from John Bertram & Sons, ranging from 600 to 2,000 pounds capacity, and a 600 pound single frame steam hammer, built by the London Machine Tool Co. There are also four Beaudry power hammers with individual motor drives. The furnaces are fired by water gas from the producer house. These were supplied by W. S. Rockwell Co., New York. The remainder of the equipment includes John Bertram & Sons and Ajax Manufacturing Co.'s bulldozers, Ajax hot pressed nut machines, Cleveland shears, Diamond Machine Co.'s grinders, R. D. Wood 60-ton stripping press, Bullard Pneumatic Tool Co.'s draw bar riveter, an Oliver grindstone, etc.

Fig. 7.—Transfer Table Between Passenger Car Repair and Paint Shop.

The Locomotive Erecting Shop.

Parallel to, and of the same construction as the machine shop, this building is 375 ft. x 81 ft. and has capacity for 24 locomotives over the pits. The arrangement of the pits is rather unique. Instead of being arranged at right angles to the length of the shop they are laid out herringbone style on either side of a central surface track which runs the entire length of the building. This centre track is used for light repairs and is provided with a shallow concrete pit. There are eight pits on either side of the central track, designed to accommodate the heavy repairs. This arrangement provides ample room and eliminates, to a great degree, the necessity of lifting the engines over one another. Serving this shop are two Babcock and Wilcox electric traveling cranes of 60-ton capacity each. These cranes are provided with 10-ton auxiliary hoists and work on a 76 ft. x 10¾ inch span.

In the pipe fitting department at the east end of this shop is an Eaton, Cole & Burnham 8-inch pipe threading machine. There are also two portable bolt lathes supplied by Williams & Wilson and 32 inch portable drill by the Cincinnati Machine Tool Co.

Boiler and Tender Shop.

This building is 375 ft. x 100 ft., divided into two bays by a row of centre columns. The bull machine and riveting tower are at the west end of the erecting shop and are served by a three motor, floor controlled Whiting electric crane of 30-tons capacity. The "bull" is a 13 ft. gap Bement machine with three controls using hydraulic pressure at 1250 pounds per square inch. The main erecting bay is served by a 35-ton Pawling & Harnischfeger electric traveling crane. The machine bay is served its entire length by a 10-ton crane. The floor is 3 inch hemlock plank on 6x6 inch sills at 3 ft. centres. All the machines are individually driven. The tube and tender shops are at the east end of the building.

The equipment is completely up to date and includes John Bertram & Sons 12 ft. x 1 inch horizontal plate rolls, 6 ft. x ⅝ inch rolls and a 20 ft. plate planer. The punches and shears include a ¾-inch rotary bevel shears, built by Lennox & Co., four punch and shears by London Machine Tool Co., an R. D. Wood 200-ton sectional flanger, a Hilles & Jones ¾-inch punch and a 24 ft. flue cleaner (pit type) by Jas. T. Ryerson & Co.

The tube and tender repair departments are at the east end of this shop. Standard and industrial tracks connect it with the machine and erecting shops. Between the boiler and erecting shops is a 25 ft. space which allows plenty of light to the adjacent sides of the shops.

Stores and Office Building.

This building is conveniently located with reference to the shops, and is a splendid example of reinforced concrete construction. Every part is of reinforced concrete with the exception of the office partitions which are of porous tile. Along two sides there is a reinforced concrete platform, 6 feet wide, which extends in the front to 25 feet. This is designed for very heavy loads and ramps on each side, at the east end, allow trucks to be run up

Fig. 8—Interior of Machine Shop, I.C.R. Shops, Monct on.

from the ground level. Freight elevators connect all floors and the basement.

The first floor and the basement are given over to local and general stores and as the building is 343 ft. 8 inches x 51 ft. 8 inches there seems to be ample space. The second storey, over the west half, is devoted to the offices of the stores department and of the superintendent of motive power. Large windows give plenty of light and the building is arranged for steam heat. The floors are of hardwood laid on reinforced concrete. The building is almost perfectly fireproof in construction.

Power House and Gas Producer Plant.

The engine and boiler rooms are each 100x69 feet, under one roof, but separated by a reinforced concrete wall. The construction is steel, and reinforced concrete. The columns are imbedded in concrete pilasters and the concrete roof is supported by steel trusses. The sides are practically all glass, giving plenty of light and the height is such that good ventilation is assured. The floor is of patented "Terrano" construction, material for which was supplied by the Eadie-Douglas Co. This makes an admirable floor, pleasing to the eye and very easily kept clean. The boiler room floor is of tar macadam, laid on a 6 inch course of gravel, well rammed and rolled.

Power Equipment (Engine Room)

The largest single unit gas engines in Canada comprise the main source of power. There are two of these, each being a 500 horse power, Westinghouse, tandem cylinder double acting four stroke cycle engine, running 150 revs. per minute on producer gas. The cylinders are 23 inches in diameter with 33 inch stroke. The weight of each engine, including shaft and generator, is about 90 tons. The cooling system is the ordinary circulating water system in vogue on small engines with the addition of a device for circulating the cooling water through the pistons. The pump supplying this circulating water for the engines and air compressor is a 300 gallon Fairbanks-Morse duplex steam pump, 8"x7"x12". A Richardson sight feed oil pump (on each gas engine) supplies oil under pressure to the pistons, packing boxes and exhaust valve stems. The other parts are oiled by gravity from a tank suspended in the roof trusses. The oil is collected in the basement and returned by a pump driven from the lay shaft by a set of mitre gears and shaft. This shaft can be seen in Fig. 10 running down through the floor. The engines are controlled by Hartung governors and are easily started by compressed air at 75 pounds per square inch furnished by a compressor in the basement. This compressor is driven by a Brown & Cochrane gas engine.

There is a double, make and break ignition at each end of each cylinder, which is connected to a "tell-tale" box consisting of an arrangment of spark coils which raise a flap every time a spark is made. This arrangement allows of close observation of the action of the ignition service. Current for ignition is supplied by a ¼ k.w. motor-generator set, which derives its current from the exciter bus bars on the main switch board.

Direct connected to the generators are the Westinghouse generators. Each is 300 k.w. capacity delivering a 220-volt 3-phase 60-cycle alternating current. The exciters are belted from pulleys on the outside of the out-board bearings. These are 17 k.w. Westinghouse machines running at 1125 revs. per min. The direct current for the cranes and variable speed motors throughout the shops is derived from a 200 k.w., 220-volt Allis-Chalmers-Bullock motor-generator set running at 575 revs. per min. For auxiliary purposes there are two 105 k.w. Canadian General Electric generators direct connected to 125 h.p. Robb-Armstrong engines.

The main air compressor outfit shown in Fig. 12 is a type B.B.3, compound Rand-Corliss engine, direct connected to a compound Rand-Corliss compressor. The capacity of this unit is 2027 cu. ft. of free air per minute at 85 revolutions, and 125 pounds per square inch steam pressure. The air is delivered at 125 pounds per square inch. A distinctive feature of the compressor is the Rand-Corliss valve gear on the low press air cylinder. This gives an unrestricted area of intake valve equal to 12 per cent. of the piston area. The sizes of the cylinders are 16 inch and 30 inch at the steam end, and 27 inch and 16 inch at the air end, with 36 inch stroke.

For fire purposes there is a Smart-Turner Machine Co.'s underwriters double compound pump, having a capacity of 1,000 gallons per minute. There is also a Smart-Turner high pressure pump 7½"x3¾"x10" for supplying the pressure used in testing the boilers, etc. The engine room is served by a Whiting crane, supplied by the Dominion Foundry Supply Co. This is a 16-ton hand power traveling crane, carrying a Yale & Towne chain block operated, by pendant hand chain, from the floor.

The switchboard, Fig. 11, when com-

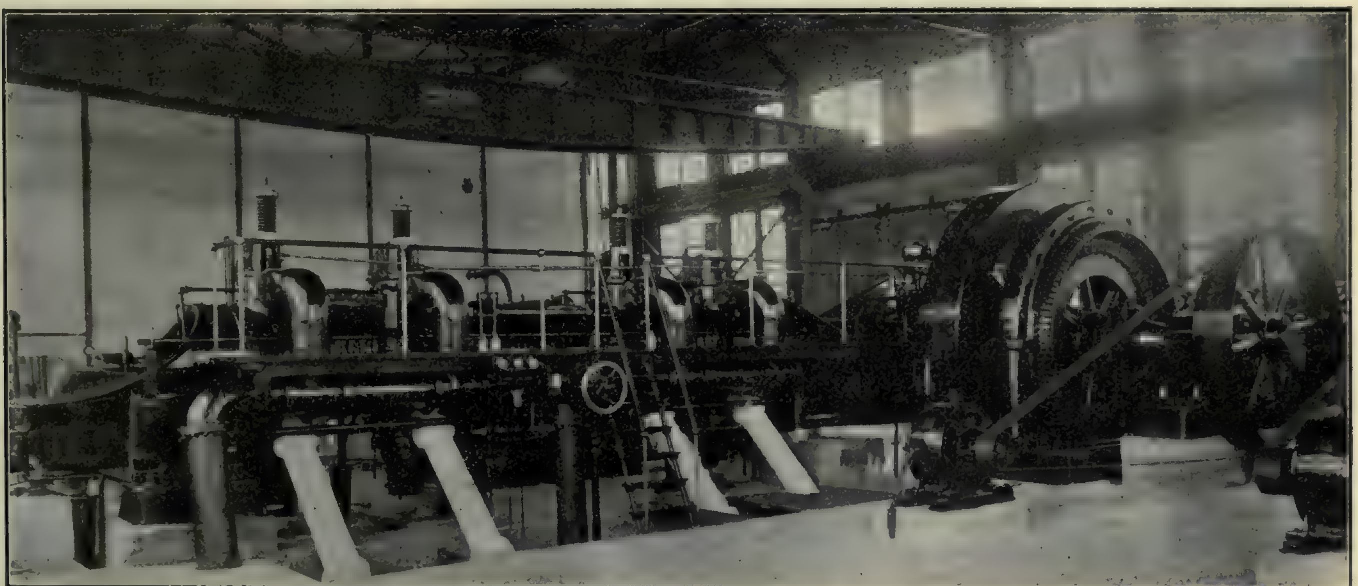


Fig. 9.—Generator Side of 500 h.p. Gas Engine in the Power House.

pleted will have sixteen panels of No. 1 Blue Vermont marble, each 96"x36", with a swinging panel on the end carrying two volt metres, power factor meter and synchronscope. The instruments are of Westinghouse make and the whole is very proportionately designed and convenient. There are four Cooper-Hewitt mercury vapor lamps for the main lighting system.

Boiler Room Equipment.

The present capacity of 1,000 horse power is furnished by four 250 h.p. Babcock & Wilcox water tube boilers in two batteries and space is provided for an additional battery. The boilers are fired by Babcock & Wilcox patented improved chain-grate mechanical stokers the hoppers of which are fed by hand from the coal bins in front of the boilers. The feed water level in the boilers is automatically regulated by two Berry safety feed water regulators, supplied by Peiler & McKenzie, Monreal. These regulators control a 3-inch pump governor in the steam supply.

Two 10"x6"x12" duplex, outside packed plunger pumps, supplied by the Smart-Turner Machine Co., furnish the feed water. This is heated by a Babcock & Wilcox vertical water tube heater having a capacity of 21,000 pounds of water per hour, and contains 319 square feet of heating surface.

Heating and Return Systems.

The heating system for the freight car repair, smith and erecting shops is situated in the boiler-room. The rest of the shops have their own independent heating systems. These are the indirect hot blast Sturtevant system with the exception of the stores and office building, which is steam heated by direct radiation. The fans and blowers were also furnished by the Sturtevant people. The hot air is forced through concrete conduits to the risers in the walls of the buildings. These discharge close to the floor near the windows.

Two sections of the system use the exhaust steam from the fan engine and other auxiliaries. For the other sections steam is taken direct from the boilers through reducing valves which bring the pressure to 40 pounds. The exception to this is in the stores and office building where the heating is by direct radiation. Here the pressure is 60 pounds.

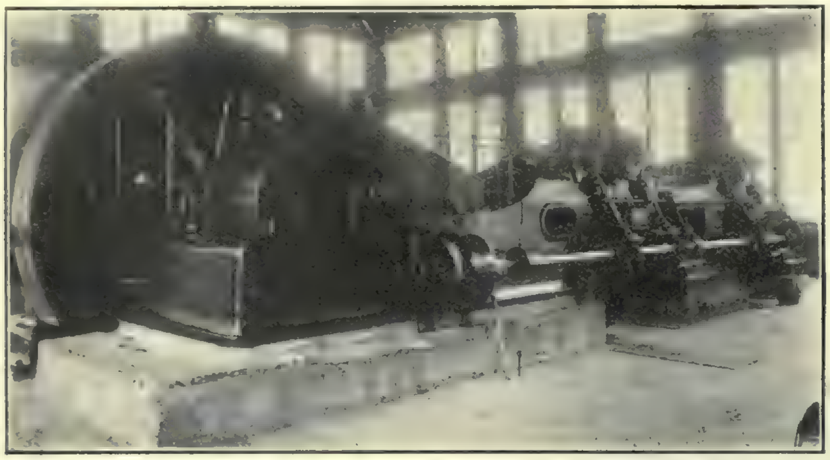


Fig. 10.—Valve Gear of 500 h.p. Gas Engine in the Power House.

The condensation (including the drips) throughout the shops is handled by Bundy steam traps supplied by Peiler & McKenzie, Montreal, and manufactured by the Bundy department of the American Radiator Co. The condensation of the exhaust is handled by means of Bundy lifting pump traps, which discharge the water to the general hot well. All the condensation from the live steam heater sections, as well as the drips from the main steam lines, lye-pots and direct radiation is handled by Bundy tank traps, which discharge to a closed receiver over the boilers. From the receiver, the water flows under pressure to two large Bundy return traps, which deliver it direct to the boilers. The whole system is automatic and there is not a pump outside of the power house.

The Sturtevant fans for the heating system and induced draft are all direct connected to their own individual engines. Two Cooper-Hewitt mercury vapor lamps are used for lighting the boiler room.

Producer House and Equipment.

This building is a steel frame structure with reinforced concrete walls and roof slab. It is of one storey with a basement with floors of steel and concrete respectively.

The apparatus was supplied by the R. D. Wood Co. There are two retorts or generators, having a combined capacity of 1,000 pounds of bituminous coal per hour, or 1,500 pounds for not more than three hours. The output is 55 cubic feet of producer gas or 18 cubic feet of water gas per pound of coal. The water gas is used in the various furnaces throughout the shops, while the engines take the producer gas. By a well arranged system of hydraulically operated valves the two forms of gas are made intermittently. Gauges connected to the holders warn the attendent of the supply in each. There is a holder having a capacity of 10,000 cubic feet for each kind of gas.

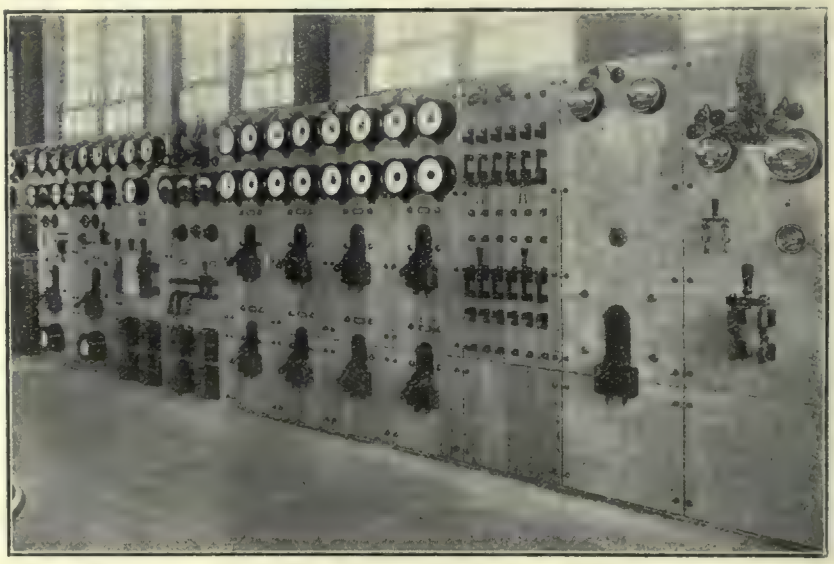


Fig. 11.—Switch Board in the Power House of the I. C. R. Shops, Moncton.

The outfit consists of these two retorts, a boiler, (into which the hot gases pass and generate steam used to run the exhauster and scrubber engine), a vertical scrubber, a rotary scrubber and a Root exhauster. The gas goes to the holders under a pressure of 3 inches of water.

The producer house is illuminated by

two Cooper-Hewitt lamps. The use of these lamps is a feature of the whole plant. There are 117 of these lamps for the main shop lighting, on the present layout. These are divided among the various shops as follows: machine shop 32, erecting shop 16, boiler shop 14, smith shop 14, freight car repair shop 10, planing mill 9, brass and tool rooms 7, bolt and nut rooms 5, engine room 4, brass foundry 2, boiler house 2, gas house 2.

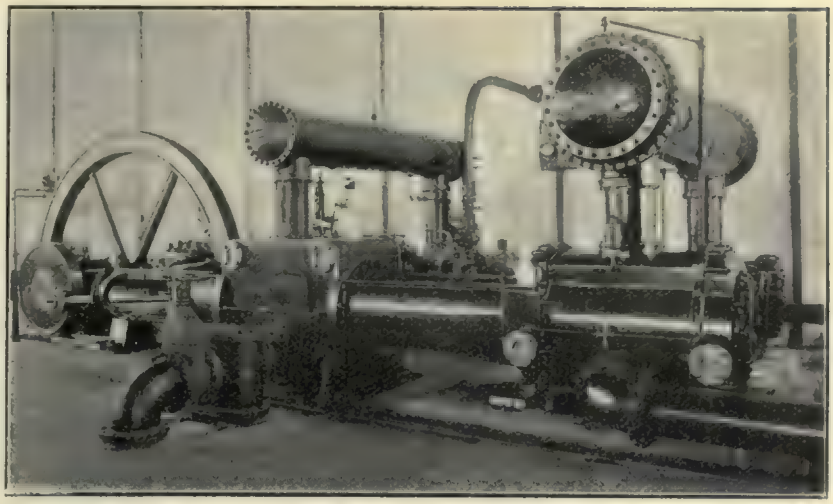


Fig. 12.—Air Compressor in the Power Plant of I. C. R. Shops, Moncton.

MACHINERY EQUIPMENT, I. C. R. SHOPS, MONCTON, N.B.

The numbers on the left correspond to the numbers on the plan and give the reader's an idea of the layout of this modern shop.

No.	Name.	Maker.	Motor.
	Wheel Department—		
1	100" Wheel Lathe	J. Bertram & Sons	1—50 h.p. 500-1000 r.p.m. D.C.
			1—7½ h.p. 1200 r.p.m. A.C.
2	72" Wheel Lathe	Fairbairn, Kennedy & Naylor	1—20 h.p. 300-1200 r.p.m. D.C.
3	Driving Wheel Journal Lathe	London Machine Tool Co	Group.
271	Loco. Quartering Machine	J. Bertram & Sons	2—5 h.p. 1200 r.p.m. A.C.
18	72" Wheel Press	Niles Tool Works	1—10 h.p. 1200 r.p.m. A. C.
268	Loco. Axle Lathe	J. Bertram & Sons	1—20 h.p. 850-1300 r.p.m. D.C.
7	84" Boring Mill	J. Bertram & Sons	1—20 h.p. 300-900 r.p.m D.C.
			1—3 h.p. 1200 r.p.m. A.C.
8	72" Fire Mill	J. Bertram & Sons	1—15 h.p. 400-1600 r.p.m. D.C.
9	60" Boring Mill	J. Bertram & Sons	1—10 h.p. 1200 r.p.m. A.C.
10	48" Boring Mill	J. Bertram & Sons	1—15 h.p. 400-1200 r.p.m. D.C.
			1—3 h.p. 1200 r.p.m. A.C.
32	48" Boring Mill	J. Bertram & Sons	1—20 h.p. 300-900 r.p.m. D.C.
			1—3 h.p. 1200 r.p.m. A.C.
267	42" Car Wheel Borer	J. Bertram & Sons	1—7½ h.p. 450-900 r.p.m. D.C.
11	42" Car Wheel Borer	J. Bertram & Sons	1—10 h.p. 400-800 r.p.m. D.C.
			1—3 h.p. 1200 r.p.m. A.C.
13	42" Car Wheel Borer	McKechnie & Bertram	Group.
5	48" Car Wheel Lathe	J. Bertram & Sons	1—20 h.p. 300-1200 r.p.m. D.C.
6	42" Car Wheel Lathe	Pond Machine Co.	1—20 h.p. 300-1200 r.p.m. D.C.
270	36" Car Wheel Lathe	J. Bertram & Sons	1—25 h.p. 325-975 r.p.m. D.C.
4	48" Car Wheel Lathe	J. Bertram & Sons	1—7½ h.p. 1200 r.p.m. A.C.
266	48" Wheel Press	J. Bertram & Sons	1—7½ h.p. 1200 r.p.m. A.C.
66	Double Car Axle Lathe	W. Sellers & Co	1—20 h.p. 850-1350 r.p.m. D.C.
	Cylinder & Frame Department—		
20	Frame Slotter, 3 head	J. Bertram & Sons	1—10 h.p. 1200 r.p.m. A.C.
21	Frame Drill 3 spindle	J. Bertram & Sons	2—5 h.p. 1200 r.p.m. A.C.
23	72"x72"x25' Planer	London Machine Tool Co.	1—30 h.p. 900 r.p.m. A.C.
39	48"x48"x20' Planer	J. Bertram & Sons	1—30 h.p. 900 r.p.m. A.C.
269	Double Bar Cylinder Borer	J. Bertram & Sons	1—10 h.p. 600-1200 r.p.m. D.C.
25	6ft. Radial Drill	J. Bertram & Sons	Group.
272	6 ft. Radial Drill	J. Bertram & Sons	1—5 h.p. 1200 r.p.m. A.C.
	Rod Department—		
26	36"x12' Horizontal Miller	Bement Miles	1—15 h.p. 900 r.p.m. A.C.
276	No. 2 Plain Miller	Brown & Sharpe	Group.
71	24 ft. D. H. Shaper	J. Bertram & Sons	Group.
31	12" Shaper	N. Y. Steam Eng. Co.	Group.
253	18" Traverse Head Shaper	J. Bertram & Sons	1—5 h.p. 1200 r.p.m. A.C.
250	8" Traverse Head Shaper	J. Butler & Co.	Group.
62	16" Lathe	J. Bertram & Sons	Group.
212	20" Lathe	J. Bertram & Sons	Group.
35	12" Lathe	R. R. Leblond	Group.
50	12" Lathe	Pratt & Whitney	Group.
296	24" Side Carriage Turret Lathe	Steinle Turret Machine Co.	Group.
213	24" Drill	London Machine Tool Co.	Group.
273	2 Spindle Rod Drill	J. Bertram & Sons	2—10 h.p. 500 1500 r.p.m. D.C.
211	4" Centering Machine	Pratt & Whitney	Group.
274	42" Vertical Miller	J. Bertram & Sons	1—15 h.p. 600-1200 r.p.m. D.C.
44	15 ton Hydraulic Press	I. C. R.	Group.
220	Swing Frame Grinder	Bridgeport Safety	1—3 h.p. 1200 r.p.m. A.C.
221	Swing Frame Grinder	Emery Wheel Co.	1—3 h.p. 1200 r.p.m. A.C.
37	Emery Grinder	I. C. R.	Group.
	Crosshead Department—		
46	6 ft. Horizontal Borer	J. Bertram & Sons	1—7½ h.p. 560-1680 r.p.m. D.C.
69	15" Slotter	S. A. Berry & Son	Group.
29	24"x24"x6' Planer	J. Bertram & Sons	1—10 h.p. 1200 r.p.m. A.C.
263	36" Drill	J. Bertram & Sons	1—5 h.p. 1200 r.p.m. A.C.
36	No. 2 Crosshead Pin Turner	Pendrie & Ayer	Group.

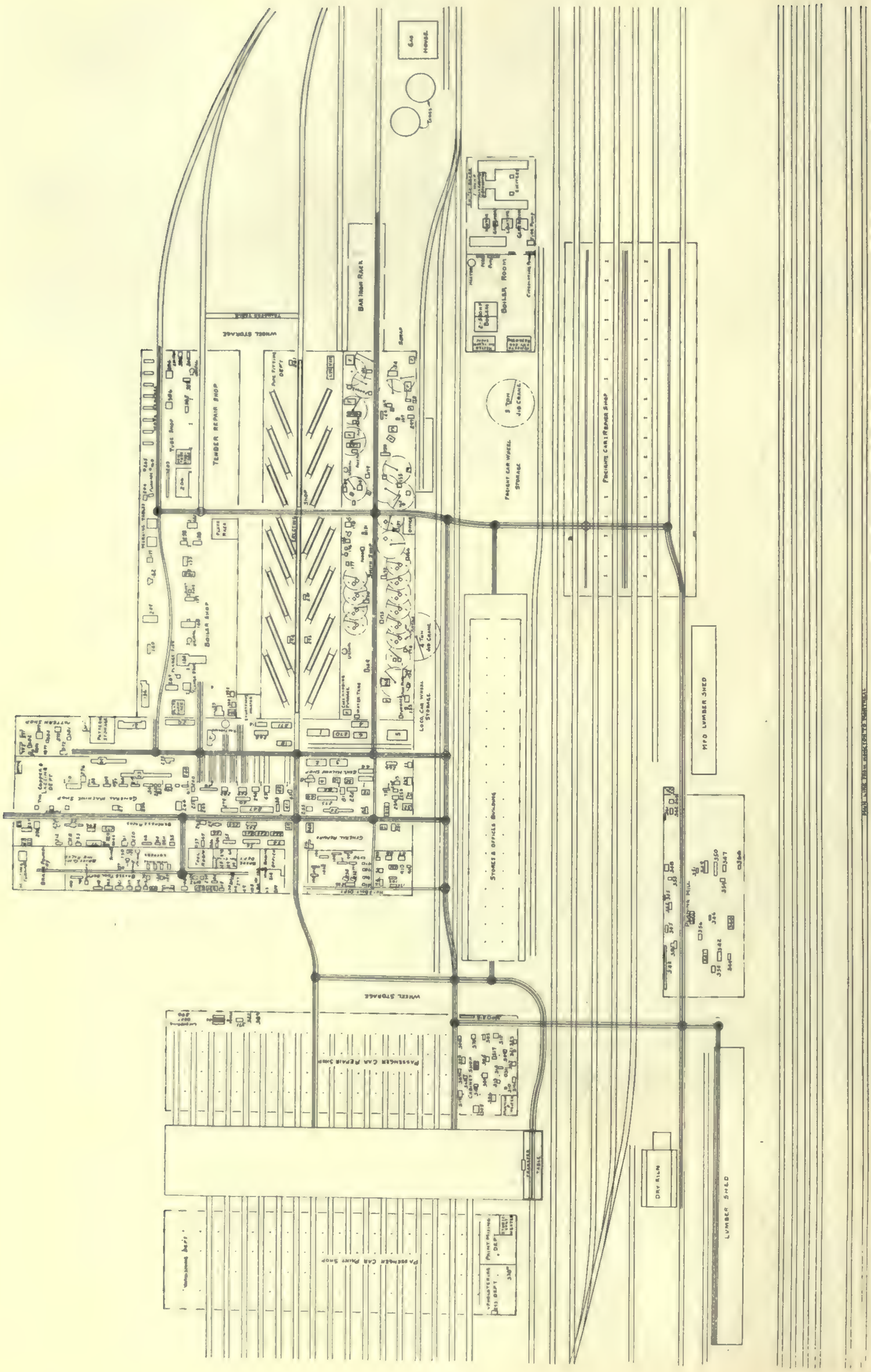


Fig. 13.—Layout of Shops I. C. R., Moncton, Showing the Machine Tool Arrangement.

No.	Name.	Maker.	Motor.
	Piston Department—		
55	36" Lathe	J. Bertram & Sons	Group.
56	36" Lathe	J. Bertram & Sons	Group.
279	32" Lathe	J. Bertram & Sons	1—10 h.p. 500-1500 r.p.m. D.C.
54	30" Lathe	J. Bertram & Sons	1—10 h.p. 400-800 r.p.m. D.C.
243	24" Lathe	J. Bertram & Sons	1—7½ h.p. 540-1430 r.p.m. D.C.
244	24" Lathe	J. Bertram & Sons	1—7½ h.p. 540-1430 r.p.m. D.C.
245	24" Lathe	J. Bertram & Sons	1—7½ h.p. 540-1430 r.p.m. D.C.
246	24" Lathe	J. Bertram & Sons	1—7½ h.p. 540-1430 r.p.m. D.C.
59	42" Boring Mill	J. Bertram & Sons	1—10 h.p. 400-1600 r.p.m. D.C.
86	Wet Emery Grinder		Group.
57	Emery Grinder		Group.
	Box Department—		
198	17" Lathe	McGregor Gourlay	Group.
199	20" Lathe	McGregor Gourlay	Group.
200	20" Lathe	McGregor Gourlay	Group.
254	24" Traverse Head Shaper	J. Bertram & Sons	1—5 h.p. 1200 r.p.m. A.C.
41	30"x30"x8' Planer	J. Bertram & Sons	1—10 h.p. 1200 r.p.m. A.C.
40	36"x36"x9' Planer	J. Bertram & Sons	1—15 h.p. 900 r.p.m. A.C.
247	36"x36"x16' Planer	London Machine Tool Co.	1—15 h.p. 900 r.p.m. A.C.
38	18" Slotter	J. Bertram & Sons	1—10 h.p. 400-1600 r.p.m. D.C.
42	36" Boring Mill	Niles Tool Works	Group.
249	30" Boring Mill	London Machine Tool Co.	1—5 h.p. 400-1600 r.p.m. D.C.
45	30" Drill	J. Bertram & Sons	Group.
43	60 ton Hyd. Press	R. D. Wood & Co.	1—5 h.p. 1200 r.p.m. A.C.
	Motion Department—		
109	14" Lathe	R. K. Leblond	Group.
64	16" Lathe	J. Bertram & Sons	Group.
61	18" Lathe	J. Bertram & Sons	Group.
219	18" Lathe	J. Bertram & Sons	Group.
34	20" Lathe	J. Bertram & Sons	Group.
33	24" Lathe	J. Bertram & Sons	Group.
48	64" Lathe (Light)	J. Bertram & Sons	Group.
252	18" Shaper	J. Bertram & Sons	1—5 h.p. 1200 r.p.m. A.C.
256	24" Shaper	J. Bertram & Sons	1—5 h.p. 1200 r.p.m. A.C.
240	8" Slotter	Pratt & Co.	1—5 h.p. 400-800 r.p.m. D.C.
264	12" Slotter	J. Bertram & Sons	1—7½ h.p. 560-1680 r.p.m. D.C.
265	36"x36"x6' Planer	J. Bertram & Sons	1—15 h.p. 1200 r.p.m. A.C.
85	18" Drill	Aurora Tool Wks.	Group.
238	2 Spindle Sensitive Drills	Henry & Wright	Group.
262	36" Drill	J. Bertram & Sons	1—5 h.p. 1200 r.p.m. A.C.
282	No. 2 Hor. Boring and Drilling Mach.	Binsse Machine Co.	1—3 h.p. 1200 r.p.m. A.C.
27	30" Vertical Miller	Bement Miles	1—5 h.p. 400-1600 r.p.m. D.C.
298	Link Grinder	London Machine Tool Co.	1—7½ h.p. 1200 r.p.m. A.C.
76	No. 4 Universal Grinder	Brown & Sharpe	Group.
87	Emery Grinder		Group.
191	Power Hack Saw	Sussex Mfg. Co.	Group.
	Brass Department—		
108	14" Lathe	R. K. Leblond	Group.
115	14" Lathe	Wood Light & Co.	Group.
116	14" Lathe	Wood Light & Co.	Group.
117	16" Lathe	American Machine & Tool Co.	Group.
118	16" Lathe	J. Whitworth & Co.	Group.
120	16" Lathe	Hendey Machine Co.	Group.
123	24" Lathe	Smith & Coventry	Group.
121	18" Brass Finishers Lathe	J. Bertram & Sons	Group.
237	2 Spindle Sensitive Drill	Alfred Herbert & Co.	Group.
127	Sensitive Drill	Davis & Egan	Group.
126	18" Drill	J. Bertram & Sons	Group.
259	30" Drill	J. Bertram & Sons	1—5 h.p. 1200 r.p.m. A.C.
112	No. 8 Shop Saw	Q. M. Sargeant	Group.
125	Circular Saw	I. C. R.	Group.
76	No. 4 Universal Miller	Brown & Sharpe	Group.
124	Plain Miller	J. Bertram & Sons	Group.
	Tool Room—		
184	10" Toolmakers Lathe	Pratt & Whitney	Group.
185	10" Toolmakers Lathe	Pratt & Whitney	Group.
114	12" Toolmakers Lathe	Pratt & Whitney	Group.
49	14" Toolmakers Lathe	Pratt & Whitney	Group.
119	14" Toolmakers Lathe	Pratt & Whitney	Group.
197	17" Lathe	McGregor Gourlay	Group.
122	20" Lathe	W. Sellars & Co.	Group.
80	3" Centering Machine	D. E. Whitton Machine Co.	Group.
251	12" Shaper	J. Butler & Co.	Group.
277	No. 3a. Heavy Universal Miller	Brown & Sharpe	Group.
236	2 Spindle Sensitive Drill	Alfred Herbert & Co.	Group.
78	Double Spindle Car Brass Borer	J. Bertram & Sons	Group.
110	Magnetic Metal Separator	Chas. T. Burlin	Group.
130	Emery Grinder		Group.
131	Emery Grinder	W. Sellers & Co.	Group.
132	Emery Grinder	The Tanite Co.	Group.
53	No. 5 Drop Apron Tool Grinder	Bridgeport S. E. W. Co.	Group.
60	No. 1 Universal & Tool Grinder	W. Sellers & Co.	Group.
278	No. 13 Universal & Tool Grinder	Brown & Sharpe	Group.
128	No. 3 Cutter & Reamer Grinder	Brown & Sharpe	Group.
129	Twist Drill Grinder	Wilmarth & Morman	Group.

No.	Name.	Maker.	Motor.
	Bolt and Nut Department—		
88	2" Six Spindle Nut Tapper	Acme Mfg. Co.	Group.
89	1½" Six Spindle Nut Tapper	Acme Mfg. Co.	Group.
234	1½" Six Spindle Nut Tapper	Acme Mfg. Co.	Group.
90	¾" Four Spindle Nut Tapper	Acme Mfg. Co.	Group.
91	¾" Four Spindle Nut Tapper	Acme Mfg. Co.	Group.
92	2" Quadruple Bolt Cutter	Acme Mfg. Co.	Group.
94	2" Triple Bolt Cutter	Acme Mfg. Co.	Group.
93	1½" Triple Stay Bolt Cutter	Acme Mfg. Co.	Group.
233	Lassiter 4-Spindle Stay Bolt Machine	Foster & Co.	Group.
95	1" Triple Bolt Cutter	Acme Mfg. Co.	Group.
96	1" Triple Bolt Cutter	Acme Mfg. Co.	Group.
97	1½" Double Bolt Cutter	Acme Mfg. Co.	Group.
98	2" Single Bolt Cutter	Acme Mfg. Co.	Group.
99	3"x36" Turret Machine	Jones & Lamson	Group.
100	2"x24" Turret Machine	Warner & Swasey	Group.
101	2" Automatic Turret Machine	Cleveland Auto Machine Co.	Group.
232	No. 3 Automatic Screwing Machine	Alfred Herbert & Co.	Group.
235	No. 2 Automatic Stud Machine	Alfred Herbert & Co.	Group.
102	2" x 17" Turret Machine	Smith & Coventry	Group.
175	1½" Nut Facer	Victor Tool Co.	Group.
104	2½" x 48" Bolt Lathe	London Machine Tool Co.	Group.
105	2½" x 48" Bolt Lathe	London Machine Tool Co.	Group.
106	12" Lathe	R. K. Leblond	Group.
107	16" Lathe	Hendey & Co.	Group.
111	20" Lathe	J. Bertram & Son	Group.
183	Four Spindle Test Hole Drill	Foote, Burt & Co.	Group.
	Miscellaneous—		
24	60" x 60" x 20' Planer	J. Bertram & Sons	1—20 h.p. 900 r.p.m. A.C.
255	24" Traverse Head Shaper	J. Bertram & Sons	1—5 h.p. 1200 r.p.m. A.C.
257	24" Traverse Head Shaper	J. Bertram & Sons	1—5 h.p. 1200 r.p.m. A.C.
68	12" Slotter	N. Y. Steam Eng. Co.	Group.
248	24" Slotter	London Machine Tool Co.	1—10 h.p. 500 1500 r.p.m. D.C.
224	20" Lathe	J. Bertram & Sons	Group.
65	26" Gap Lathe	McGregor Gourlay	Group.
2,3	42" Lathe	J. Bertram & Sons	1—10 h.p. 500 1500 r.p.m. D.C.
294	Portable Bolt Lathe	Williams & Wilson	1—2 h.p. 1700 r.p.m. A.C.
295	Portable Bolt Lathe	Williams & Wilson	1—2 h.p. 1700 r.p.m. A.C.
239	2 Spindle Sensitive Drill	Henry & Wright	Group.
208	3 Spindle Sensitive Drill	Henry & Wright	Group.
74	24" Drill	F. Kennedy & Naylor	Group.
75	24" Drill	F. Kennedy & Naylor	Group.
258	30" Drill	J. Bertram & Sons	1—5 h.p. 1200 r.p.m. A.C.
260	30" Drill	J. Bertram & Sons	1—5 h.p. 1200 r.p.m. A.C.
281	32" Drill (Portable)	Cincinnati Machine Tool Co.	1—5 h.p. 1200 r.p.m. A.C.
261	36" Drill	J. Bertram & Sons	1—5 h.p. 1200 r.p.m. A.C.
82	40" Drill	Niles Tool Wks.	1—3 h.p. 1200 r.p.m. A.C.
72	6 ft. Radial Drill	F. Kennedy & Naylor	Group.
83	3 Spindle Drill	J. Bertram & Sons	1—7½ h.p. 1200 r.p.m. A.C.
215	8 Spindle Arch Bar Drill	J. Bertram & Sons	1—15 h.p. 900 r.p.m. A.C.
217	4" Centering Machine	Pratt & Whitney	Group.
225	Twist Drill Grinder		Group.
81	Wet Emery Grinder		Group.
79	Cold Saw	London Machine Tool Co.	1—5 h.p. 1200 r.p.m. A.C.
192	Power Hack Saw	Sussex Mfg. Co.	Group.
	Laboratory—		
113	10" Lathe	Pratt & Whitney	Group.
209	Stay Bolt Vibrator	I. C. R.	Group.
210	Spring Tester		Group.
214	Tension & Comp. Testing Machine	Olsen	Group.
	Tender Shop—		
384	30" Auto Cut-off Saw	Greenlee Bros.	1—15 h.p. 900 r.p.m. A.C.
386	30" Self Feed Rip Saw	Greenlee Bros.	1—15 h.p. 900 r.p.m. A.C.
385	16" Buzz Planer	McGregor Gourlay	1—7½ h.p. 1200 r.p.m. A.C.
387	Mortiser & Borer	Greenlee Bros.	1—15 h.p. 900 r.p.m. A.C.
388	Grindstone	Oliver Machine Co.	1—2 h.p. 1800 r.p.m. A.C.
260	30" Drill	J. Bertram & Sons	1—5 h.p. 1200 r.p.m. A.C.
	Boiler and Tank Shop—		
133	13' Stake Hyd. Rivetter	W. Bement	
134	12' x 1" Plate Rolls	J. Bertram & Sons	1—20 h.p. 720 r.p.m. A.C. 1—7½ h.p. 720 r.p.m. A.C.
135	6' x ⅝" Plate Rolls	J. Bertram & Sons	1—7½ h.p. 1200 r.p.m. A.C.
136	20' Plate Planer	J. Bertram & Sons	1—15 h.p. 900 r.p.m. A.C.
287	200 ton Hyd. Sectional Flanger	R. D. Wood & Co.	
148	1¼" Plate Spiitting Shear	London Machine Tool Co.	1—15 h.p. 900 r.p.m. A.C.
141	¾" Punch or Shear, 40" throat	London Machine Tool Co.	1—5 h.p. 1200 r.p.m. A.C.
168	⅞" Shear 36" Throat	London Machine Tool Co.	1—7½ h.p. 1200 r.p.m. A.C.
182	¾" Rotary Bevel Shears	Lennox & Co.	1—7½ h.p. 1200 r.p.m. A.C.
299	1¼" Punch 48" Throat	London Machine Tool Co.	1—10 h.p. 1200 r.p.m. A.C.
137	1" Hor. Flange Punch	Long & Allstatter	1—5 h.p. 1200 r.p.m. A.C.
138	¾" Punch	London Machine Tool Co.	1—5 h.p. 1200 r.p.m. A.C.
139	½" Punch	Hilles & Jones	1—3 h.p. 1200 r.p.m. A.C.
206	24' Flue Cleaner (pit type)	Jos. T. Ryerson & Co.	1—30 h.p. 720 r.p.m. A.C.
205	Double Cyl. Pneu. Flue Welder	Draper Mfg. Co.	
204	Flue Welder and Cutter	Hartz	1—5 h.p. 1200 r.p.m. A.C.
203	Flue Cutter	I. C. R.	1—3 h.p. 1200 r.p.m. A.C.
160	Flue Ferrule Cutter	I. C. R.	1—3 h.p. 1200 r.p.m. A.C.

No.	Name.	Maker.	Motor.
	Blacksmith Shop—		
154	4,000 lb. D. F. Steam Hammer	Bement Miles & Co.	
181	2,000 lb. Single Frame Steam Hammer	J. Bertram & Sons	
155	1,800 lb. Single Frame Steam Hammer	J. Bertram & Sons	
157	1,200 lb. Single Frame Steam Hammer	J. Bertram & Sons	
156	1,000 lb. Single Frame Steam Hammer	J. Bertram & Sons	
173	600 lb. Single Frame Steam Hammer	J. Bertram & Sons	
172	600 lb. Single Frame Steam Hammer	London Machine Tool Co.	
174	No. 11 Champion Power Hammer	Beaudry & Co.	1—10 h.p. 1200 r.p.m. A.C.
177	No. 9 Champion Power Hammer	Beaudry & Co.	1—7½ h.p. 1200 r.p.m. A.C.
166	No. 9 Champion Power Hammer	Beaudry & Co.	1—7½ h.p. 1200 r.p.m. A.C.
176	No. 7 Champion Power Hammer	Beaudry & Co.	1—5 h.p. 1200 r.p.m. A.C.
153	Small Power Hammer		1—3 h.p. 1200 r.p.m. A.C.
145	3" Header	Acme Machinery Co.	1—20 h.p. 900 r.p.m. A.C.
178	2" Header	Acme Machinery Co.	1—15 h.p. 900 r.p.m. A.C.
146	1½" Header	Acme Machinery Co.	1—10 h.p. 1200 r.p.m. A.C.
147	1" Header	Ajax Mfg. Co.	1—7½ h.p. 720 r.p.m. A.C.
180	No. 9 Bulldozer	Ajax Mfg. Co.	1—30 h.p. 900 r.p.m. A.C.
143	No. 6½ Bulldozer	J. Bertram & Sons	1—20 h.p. 900 r.p.m. A.C.
144	2 Cylinder Air Bulldozer	I. C. R.	
170	1½" Hot Pressed Nut Machine	Ajax Mfg. Co.	1—15 h.p. 900 r.p.m. A.C.
297	1" Hot Pressed Nut Machine	Ajax Mfg. Co.	1—7½ h.p. 900 r.p.m. A.C.
171	No. 3 Taper Forging Roll	Ajax Mfg. Co.	1—30 h.p. 900 r.p.m. A.C.
152	Spring Punch, Shear & Roller	McDougall & Co.	1—5 h.p. 1200 r.p.m. A.C.
167	Eye Vender	Williams, White	1—3 h.p. 1200 r.p.m. A.C.
162	Draw Bar Rivetter	Bullard Pneu. Tool Co.	
163	60 ton Spring Banding & Stripping Press	R. D. Wood & Co.	
169	No. 6 Guillotine Bar Shear	Cleveland P. & S. Co.	1—30 h.p. 900 r.p.m. A.C.
179	2½" Bar Iron Shear	Bertrams, Limited	1—10 h.p. 1200 r.p.m. A.C.
151	1½" Bar Iron Shear	Long & Allstatter	1—3 h.p. 1200 r.p.m. A.C.
150	No. 6 Scrap Shear	J. Bertram & Sons	1—10 h.p. 1200 r.p.m. A.C.
149	Scrap Shear	J. Bertram & Sons	1—5 h.p. 1200 r.p.m. A.C.
165	Scrap Shear	Platt	
289	No. 2 Lion File Cutting Machine	R. Denison	1—5 h.p. 1200 r.p.m. A.C.
290	Stripping and Abrading Machine	R. Denison	1—3 h.p. 1200 r.p.m. A.C.
291	Whetting Machine	R. Denison	1—2 h.p. 1800 r.p.m. A.C.
187	No. 2 Drop Apron Tool Grinder	Diamond Machine Co.	1—1 h.p. 1200 r.p.m. A.C.
186	No. 2 Drop Apron Tool Grinder	Diamond Machine Co.	1—3 h.p. 1200 r.p.m. A.C.
164	Grindstone	Oliver Machine Co.	1—2 h.p. 1800 r.p.m. A.C.
	Tin Shop—		
226	72" Squaring Shears	Niagara M. & T. Works	1—3 h.p. 1200 r.p.m. A.C.
227	72" Rolls	Niagara M. & T. Works	1—3 h.p. 1200 r.p.m. A.C.
228	72" Folder	Niagara M. & T. Works	
229	36" Squaring Shears	Niagara M. & T. Works	1—2 h.p. 1800 r.p.m. A.C.
241	8" Pipe Machine	Eaton, Cole & Burnham	1—3 h.p. 1200 r.p.m. A.C.
242	6" Pipe Machine	Fairbanks Morse	1—1.75 h.p. 800-1600 r.p.m. D.C.
280	Circle and Slitting Shear	Niagara M. & T. Works	1—3 h.p. 1200 r.p.m. A.C.
	Pattern Shop—		
372	16" Hand Planer and Jointer	Oliver Machine Co.	1—5 h.p. 1200 r.p.m. A.C.
373	Universal Saw Bench	Oliver Machine Co.	1—5 h.p. 1200 r.p.m. A.C.
374	16" Double End Patternmakers Lathe	Oliver Machine Co.	1—3 h.p. 1200 r.p.m. A.C.
375	88" Patternmakers Face Lathe	Oliver Machine Co.	1—7½ h.p. 1200 r.p.m. A.C.
376	20" Double D sc Sander	Oliver Machine Co.	1—5 h.p. 1200 r.p.m. A.C.
377	Emery Grinder	Oliver Machine Co.	1—3 h.p. 1200 r.p.m. A.C.
379	40" Scroll & Resaw	H. B. Smith Machine Co.	1—7½ h.p. 1200 r.p.m. A.C.
380	Core Box Machine	Fox Machine Co.	1—5 h.p. 1200 r.p.m. A.C.
381	26" Single Surfacer	Sussex Mfg. Co.	1—15 h.p. 900 r.p.m. A.C.
382	No. 6 Column Scroll Saw	J. A. Fay & Egan	1—2 h.p. 1800 r.p.m. A.C.
391	12" Motor Head Speed Lathe	Oliver Machine Co.	1—½ h.p. 700-2100 r.p.m. D.C.
	Cabinet Shop—		
301	26" Planer and Smoother	McGregor Gourlay	1—15 h.p. 900 r.p.m. A.C.
302	24" Planer	Oliver Machine Co.	1—7½ h.p. 900 r.p.m. A.C.
303	12" Buzz Planer	Cowan & Co.	1—5 h.p. 1200 r.p.m. A.C.
304	No. 1 Universal Wood Worker	Goldie & McCulloch	1—3 h.p. 1200 r.p.m. A.C.
305	42" Three Drum Sander	Cowan & Co.	1—30 h.p. 900 r.p.m. A.C.
306	Q1. Tenoner	McGregor Gourlay	1—5 h.p. 1200 r.p.m. A.C.
367	V. J. Hand Gainer	McGregor Gourlay	1—7½ h.p. 1200 r.p.m. A.C.
307	8" Four Side Moulder	McGregor Gourlay	1—7½ h.p. 1200 r.p.m. A.C.
368	S. P. Panelling, Edge and Sur. Moulder	McGregor Gourlay	1—3 h.p. 1200 r.p.m. A.C.
308	Double Spindle Shaper	Clark Demill Co.	1—7½ h.p. 1200 r.p.m. A.C.
309	1½" Hollow Chisel Mortiser	Fay & Egan	1—7½ h.p. 1200 r.p.m. A.C.
	Boring Attachment		1—2 h.p. 1800 r.p.m. A.C.
310	¾" Horz. Hollow Chisel Mortiser	Cowan & Co.	1—3 h.p. 1200 r.p.m. A.C.
311	3 Spindle Borer	McGregor, Gourlay	1—3 h.p. 1200 r.p.m. A.C.
312	24" Lathe	McGregor, Gourlay	1—3 h.p. 1200 r.p.m. A.C.
300	22" Auto Cut-off Saw	Fay & Egan	1—7½ h.p. 1200 r.p.m. A.C.
370	20" Self-feed Rip Saw	McGregor, Gourlay	1—10 h.p. 1200 r.p.m. A.C.
317	Universal Saw Bench	Oliver Machine Co.	1—5 h.p. 1200 r.p.m. A.C.
318	Double Circular Sawing Machine	Fay & Egan	1—5 h.p. 1200 r.p.m. A.C.
319	V.C. Double Cut-off Saw	McGregor, Gourlay	1—7½ h.p. 1200 r.p.m. A.C.
316	Dado and Saw	Cowan & Co.	1—3 h.p. 1200 r.p.m. A.C.
315	40" Scroll & Re-saw	H. B. Smith Machine Co.	1—7½ h.p. 1200 r.p.m. A.C.
314	36" Band Saw	Cowan & Co.	1—3 h.p. 1200 r.p.m. A.C.
313	No. 2 Scroll Saw	Oliver Machine Co.	1—2 h.p. 1800 r.p.m. A.C.
369	S.R. Vertical Embosser	McGregor, Gourlay	1—5 h.p. 1200 r.p.m. A.C.
321	No. 3 Emery Grinder	Ransom Mfg. Co.	Group.

No.	Name.	Maker.	Motor.
	Cabinet Shop—(Continued.)		
322	No. 2 Emery Grinder	Ransom Mfg. Co.	1—2 h.p. 1800 r.p.m. A.C.
323	Grindstone	Oliver Machine Co.	Group.
389	Grindstone	Oliver Machine Co.	1—2 h.p. 1800 r.p.m. A.C.
293	Single Sweeper Vacuum Cleaner	Can. V. Cleaner Co.	1—2 h.p. 1800 r.p.m. A.C.
371	4" Pipe Threader	Eaton Cole & Burnham	1—2 h.p. 500-1000 r.p.m. D.C.
390	Emery Buffer & Polisher		1—3 h.p. 1200 r.p.m. A.C.
338	Hair Picking Machine	A. Dutton	
339	Pipe Bender	Chicago P. Tool Co.	
337	Auto. Sash and Door Clamp	Cowan & Co.	
324	Foot Miter Machine	McGregor, Gourlay	
	4 No. 1 Trimmers	Oliver Machine Co.	
	5 No. 3 Trimmers	Oliver Machine Co.	
	3 No. 4 Trimmers	Oliver Machine Co.	
	Planing Mill—		
340	No. 171 Planer and Matcher	Fay & Egan	1—75 h.p. 900 r.p.m. A.C.
341	Q. Y. Planer and Matcher	McGregor, Gourlay	Group.
342	Q. Q. Planer and Matcher	McGregor, Gourlay	Group.
343	No. 32 Dimension Planer	Fay & Egan	1—15 h.p. 900 r.p.m. A.C.
344	No. 88 Single Surfacer	S. A. Woods	Group.
345	16" Variety W. Worker with Mortiser	Greenlee Bros.	Group.
346	16" Variety W. Worker with Borer	Fay & Egan	1—7½ h.p. 1200 r.p.m. A.C.
347	No. 151 Vert. Auto Car Sill Tenoner	Fay & Egan	Group.
348	No. 4 Large Car Tenoner	Fay & Egan	Group.
349	No. 3 Car Gainer	Fay & Egan	1—20 h.p. 900 r.p.m. A.C.
350	No. 300 Hollow Chisel Car Mortiser	S. A. Woods	Group.
351	3 Spindle Car Borer	Fay & Egan	Group.
352	3 Spindle Medium Borer	Greenlee Bros.	Group.
358	No. 3 Auto Cut-off Saw	Fay & Egan	1—15 h.p. 900 r.p.m. A.C.
359	No. 3½ Sill Cut off Saw	Fay & Egan	1—15 h.p. 900 r.p.m. A.C.
360	No. 229-11½ ft. Con. Double Cut-off Saw	Berlin Machine Works	1—15 h.p. 900 r.p.m. A.C.
356	No. 5 Self Feed Rip Saw	Greenlee Bros.	1—20 h.p. 900 r.p.m. A.C.
355	No. 3 Car Rip Saw	Fay & Egan	1—10 h.p. 1200 r.p.m. A.C.
354	R. I. Self Feed Rip Saw	McGregor, Gourlay	Group.
357	22" Rip Saw	I. C. R.	Group.
353	U. O. Band and Re.Saw	McGregor, Gourlay	Group.
364	No. 4 Grinder	Ransom Mfg. Co.	Group.
365	No. 3 Grinder	Ransom Mfg. Co.	Group.
366	18" Grindstone	Oliver Machine Co.	Group.
361	30" Planer Knife Grinder	S. A. Woods	Group.
362	Band Saw Setting and Filing Machine	Atlantic Works Inc.	Group.
363	No. 93 Auto Circular Saw Sharpener	Oliver Machine Co.	Group.

Power House.

2—300 k.w. generators, 3 phase, 60 cycle, 220 volt, alternating current direct connected to.

2—500 h.p. gas engines, 150 r.p.m., using producer gas. Both the generators and the engines are manufactured by Westinghouse Machine Co.

1—200 k.w. motor generator, 220 volt direct current, Allis, Chalmers, Bullock.

1—70 k.w. motor generator, 220 volt, direct current. Westinghouse Machine Co.

2—105 k.w. generators, 3 phase, 60 cycle 2,200 volts, alternating current. Canadian General Electric. Direct conoected to.

2—14" x 14" single cylinder steam engines 257 r.p.m. Robb Engineering Co.

1—2000 cu. ft. cross compound Corliss steam, two stage air compressor. Air cylinders 16" & 30"; steam cylinders 16" & 27" x 36" stroke. Can. Rand Co.

1—1000 gallon Compound Duplex steam pump, steam cylinders 12" & 18½"; water cylinders 10" x 12" stroke. Smart, Turner Machine Co.

1—300 gallon Duplex steam pump, 8" x 7" x 12". For providing the circulating water for gas engines and air compressor. Fairbanks Morse Co.

2—Watertube boilers, 5,346 sq. ft. heating surface, 160 lbs. pressure. With chain grates. Babcock & Wilcox, Ltd.

2—10" x 6" x 12" Duplex, outside packed plunger pumps for boiler feed equipped with "Berry" governor in connection with "Berry" feed water regulators on boilers. Smart, Turner Mach. Co.

1—Vertical water tube feed water heater, 319 sq. ft. heating surface. Capacity 21,000 lbs. water per hour. Babcock & Wilcox.

Gas Producer House.

The Producer Gas Plant has capacity of 1,000 lbs. of coal per hour, or 1,500 lbs. of coal for not more than three hours. The output is 55 cubic feet of producer gas, and 18 cubic feet of water gas per pound of coal.

There is a holder for each kind of gas with a capacity of 10,000 cubic feet each.

Acheson Graphite Company's Hydro-Electric Plant.

The International Acheson Graphite Co. is enlarging the output capacity of its branch works in Niagara Falls, Ont.

This company has long operated a Canadian branch with facilities far in excess of the demands of the Canadian trade. It recognizes, however, in the hydro-electric development, now so active throughout the Dominion, and the new trade spirit and energy everywhere present throughout Canada, an indication of an additional industrial enterprise, and it is to meet the prospective demand for its product, that it is increasing the size and output capacity of its existing plant in Niagara Falls, Ont.

A new furnace room providing for a 1,000-horsepower unit, is being built, and on completion the new furnace installation will be placed in operation. This will be an important aid in the development of Canadian resources, particularly now that so much attention is being paid to new processes, which mean much for the future of the Dominion. Especially is this true of electrometallurgy and electrochemistry, the product of the enlarged works of the International Acheson Graphite Co., at Niagara Falls placing all such industries in close touch with a ready supply of electrodes.

It may be noted that the International Acheson Graphite Co. is the only maker of artificial graphite in the world. The Acheson graphite is made in the electric furnace. All other graphite is mined.

BOOK REVIEWS.

STEAM POWER PLANT PIPING SYSTEMS—By William L. Morris, M.E. Published by the McGraw-Hill Book Co., New York. 490 pages, 6 x 9 ins., illustrated. Price $5 net.

This book treats of such parts of the power plant relating to piping. All auxiliary apparatus in the pipe line between the boiler and engine and in the various systems for steam, oil, air, etc., are taken up and their general design discussed.

There are thirty-one chapters, each taking up a different phase of the subject. Chapter 1 takes up Origin of Improper Piping, 2 Piping, Diagrams, 3 Piping Systems, 4 Condensers and Heaters, 5 Live Steam Drips, 6 Blowoff and Exhaust Piping, 7 Air and Oiling Systems, 10 Live Steam Details, 11 Vacuum Exhaust Details, 13 Boiler Feed Details, 26 Steam Drip Details, 27 Oil and Drip Piping Details, etc.

This will give the reader an idea of the comprehensive way in which the subject is treated. Another subject covered is City Water Piping, making the volume very complete. It is a useful book of reference which should be in the library of every progressive engineer.

PROCEEDINGS UNDERGRADUATE SOCIETY—Published by the Canadian Engineer, Toronto, 77 pages, 6 x 9 ins., illustrated. Price 25 cts.

The book contains addresses before the Undergraduate Society of the Faculty of Applied Science, at McGill University, of Montreal. These include six papers, the Relation of the Engineer to the Community; Description, Instalation and Economy of CO_2 Recorders; Value of Gas Power, etc.

Some Recent Improvements Made in Bertram Planers

John Bertram & Sons Co., Dundas, Ont., Have Installed Special Planers in G.T.R. Shops, Toronto, and Made Several Improvements on the 54-in. Planer.

The accompanying cuts show some frog and switch planers recently installed at the Grand Trunk Railway switch shops, in Toronto, by The John Bertram & Sons Co., Ltd., of Dundas, which have made and are making rather startling records for themselves. At least they are startling to the man who is conversant with the average output of machines of this class.

As regards the machines themselves, there is nothing in their general appearance to call for comment except perhaps their general stockiness and simplicity. They look to have been designed for the work they are doing, and that back of the intention was the knowledge gained by experience which consists as much in knowing what to leave off as what to put on. Convenience is there, but many attachments often causing trouble and delay by getting out of order, are absent.

In adition to the capability of the planers for their work, there must not be overlooked the handiness of the fixtures for setting and holding the work. These fixtures were originated and put on the planers by Mr. Garden, who is foreman of the shop, (Mr. Garden has since been transferred to the Montreal shops), and are decided time savers and most efficient.

Referring to the cuts:—Fig. 1 shows the standard planer arranged with motor drive, a constant speed one in this case.

The length of table is 23' for the switch planer referred to in this article. The cutting and return speeds are made in most cases to suit the idea of the purchaser and depend upon the kind of rails he must handle and the quality and shape of the tools to be used.

Fig. 2 shows the switch planer working on a pair of 100-lb rails. These rails are high in manganese, and quite above the average for hardness. Records made on such rails are therefore the more to be commended than if made on rails of average hardness. This machine is belt driven, but is expected to be motor driven later, and the machine was so designed.

On the end of the table may be seen a lot of chips that perhaps show better than figures, the work the machine is doing. They were not piled there for photographic purposes, but are the result of regular work.

In ten hours this planer removed 1,140 lbs of material, and as, of course, it is not cutting all the time or even half of the time, it means that when it is working, it must take cuts rather large in size. The number of pairs of switch rails finished in 10 hours is 6 or 12 rails in all, which is far beyond the guarantee under which the planer was sold.

Fig. 3 shows the frog planer. This is also belt driven, and arranged to be converted to motor driven later, and is practically the duplicate of the switch planer, except the length of table, which is 16'. In 9 hours, this planer finished 32

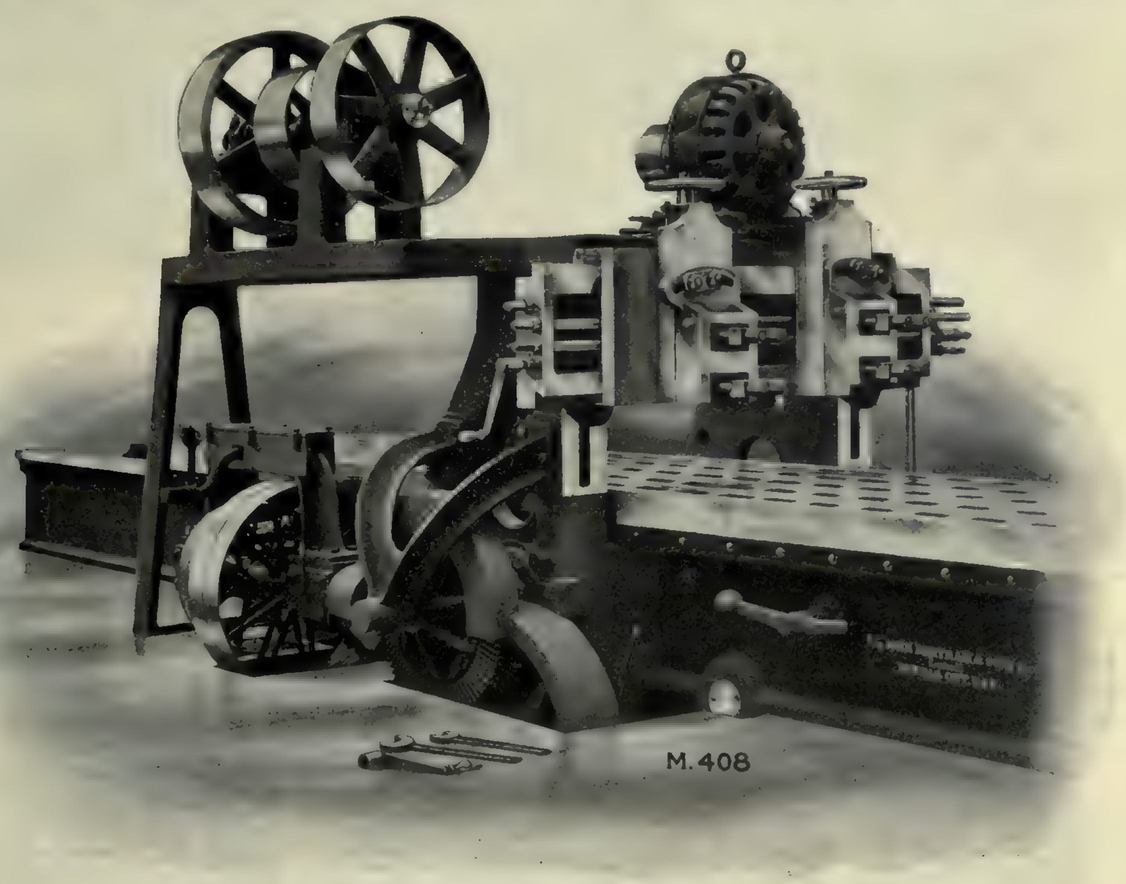


Fig. 1.—Standard Planer With Motor Drive.

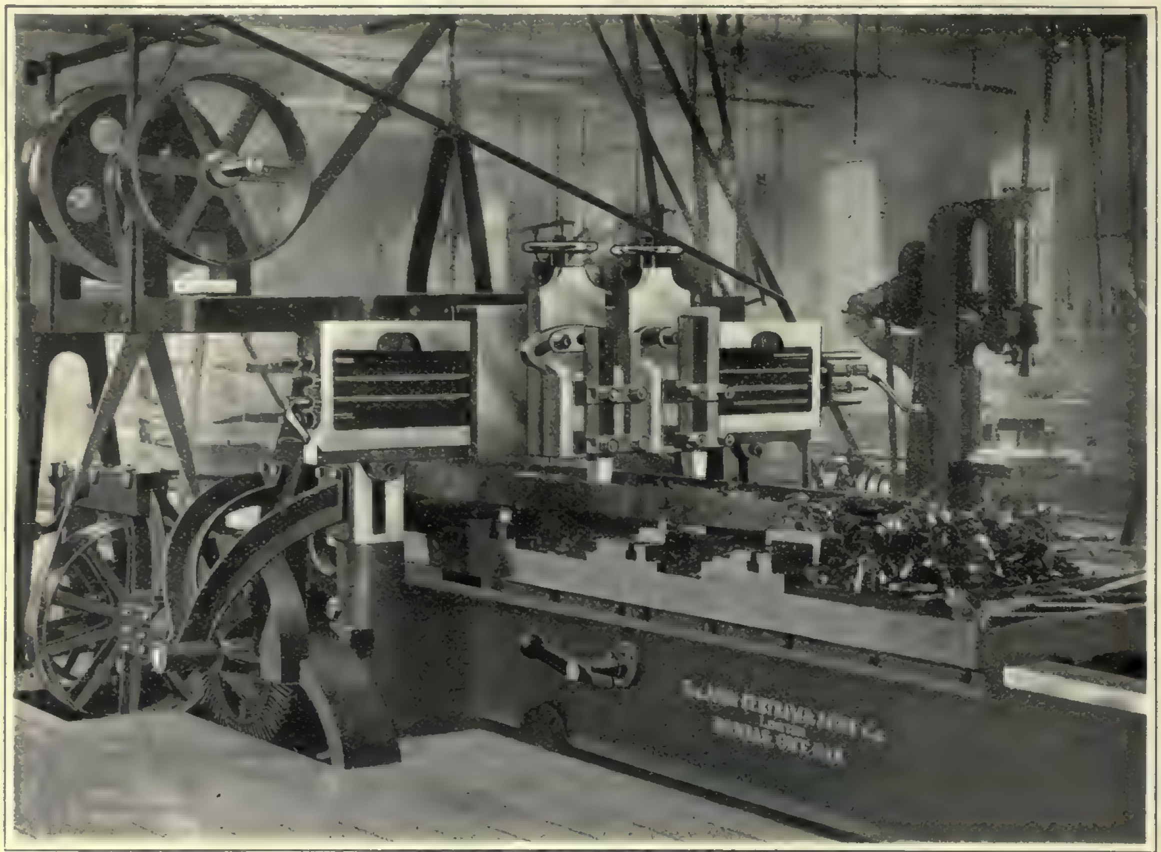


Fig. 2.—Switch Planer Working on 100-lb Rails.

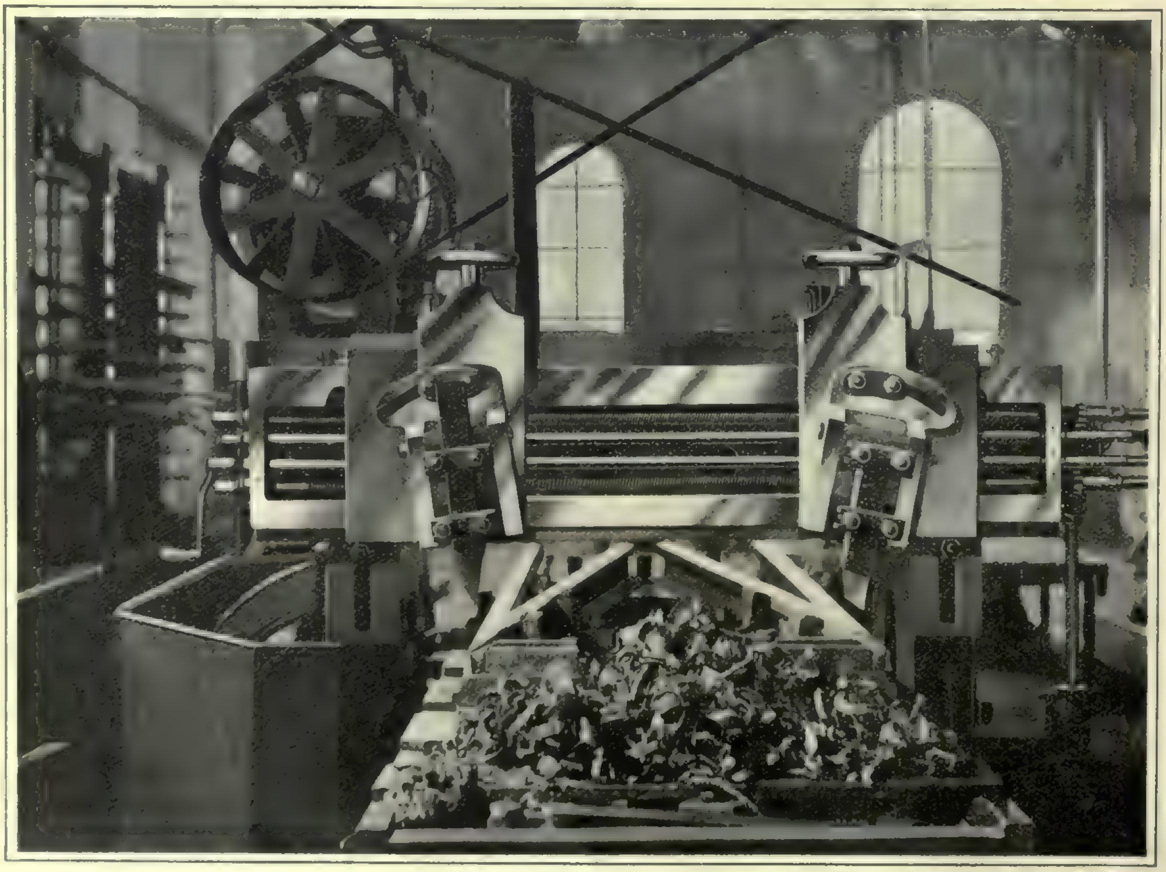


Fig. 3.—Frog Planer.

frog points, removing in that time 576 lbs of metal.

While these performances may not be the best ever made, they are cerainly good, and when all conditions are considered it will undoubtedly be admitted that they are hard to beat.

Improved 54" Planer.

Important improvements in Bertram planer construction are well illustrated in the attached cuts, showing a heavy 54-inch planer recently built at the shops of The John Bertram & Sons Co., at Dundas.

Notable among these is the new style of four-belt drive shown in Fig. 4. By the use of two driving belts and two reversing belts, greater driving power with reduced belt speed is obtained. There is a resulting steadiness while cutting, and accuracy and precision at point of reversal. This obviates the use of belts reversing at a high peripheral speed, a very objectionable feature, owing to the constant slip of the belt, especially at the ends of the stroke and unavoidable loss of power.

Fif. 5 illustrates the improved feed mechanism, which is of the positive gear type. The one feed box is used to operate the four planer heads, and these four heads may be fed separately or together in varied directions at different cutting speeds at the same time. This construction does away with the vertical feed rack, a contrivance which was very apt to wear loose and get out of adjustment. The feeds are all obtained from the right hand side of the planer, the drive being also on the same side. Both crossrail weights are carried beyond the left hand housing, which places them completely out of the operator's way.

The crossrail heads are made right and left hand, which makes it possible to bring the tools together on the rail when necessary. These heads are constructed with outside clapper boxes, which give a wide face for tool adjustment and accommodate a wide variety and size of tools. The side heads may be lowered below the surface of the working table to allow of wide work.

This style of drive is readily convertible from belt to motor or from right angle to parallel drive, after the planer has been already built.

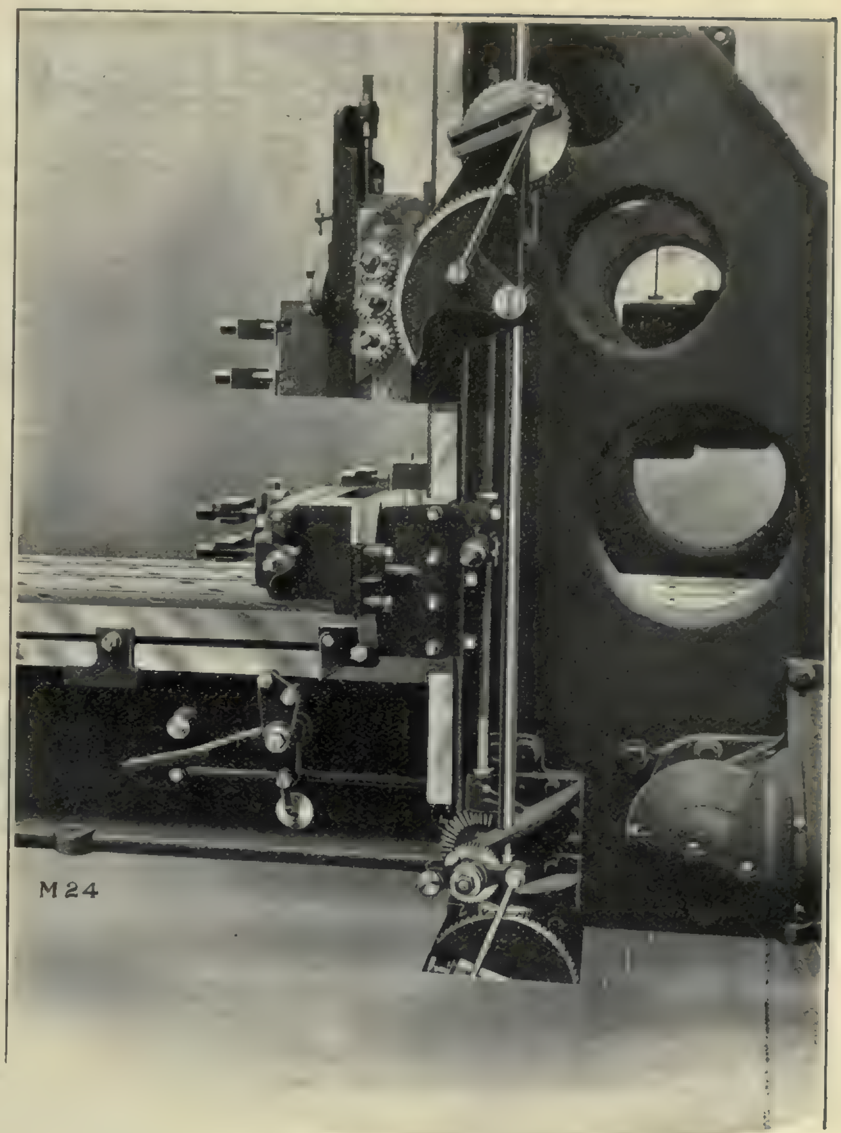


Fig. 5.—Improved Feed Mechanism.

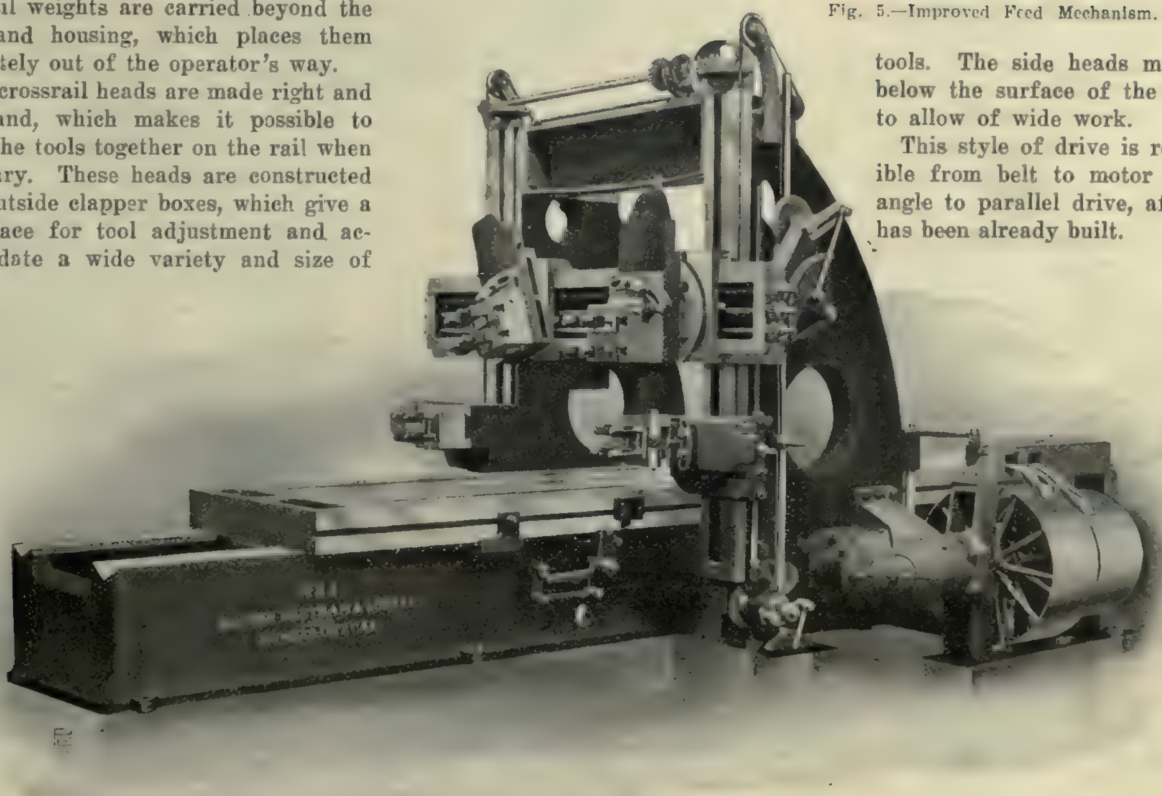


Fig. 4.—54-inch Planer with Four Heads and Four Belt Drives.

The machine shown has a clear table length of 14 feet, and a bed length of 23 feet. All gears are steel. It has power elevation to crossrail and parallel drive. The design of the planer throughout is to give maximum reduction for work within its range. The width centre to centre of the "V's" is unusually large, as well as the working surface of the "V's" themselves.

The results obtained have been very satisfactory, and it would appear that these improvements must make a permanent and necessary place for themselves in upto-date planer construction.

5—Oil house, 30' x 40'.

6—Power house, 154' 9'' x 110'. The engine room floor is oiled maple and boiler room floor is concrete.

7—Carpenter shop and pattern stores, 104' 9'' x 74' 9''.

8—Steel water tank, capacity 100,000 gallons, 125' above ground.

9—Chimney, 200' high, 11' average inside diameter.

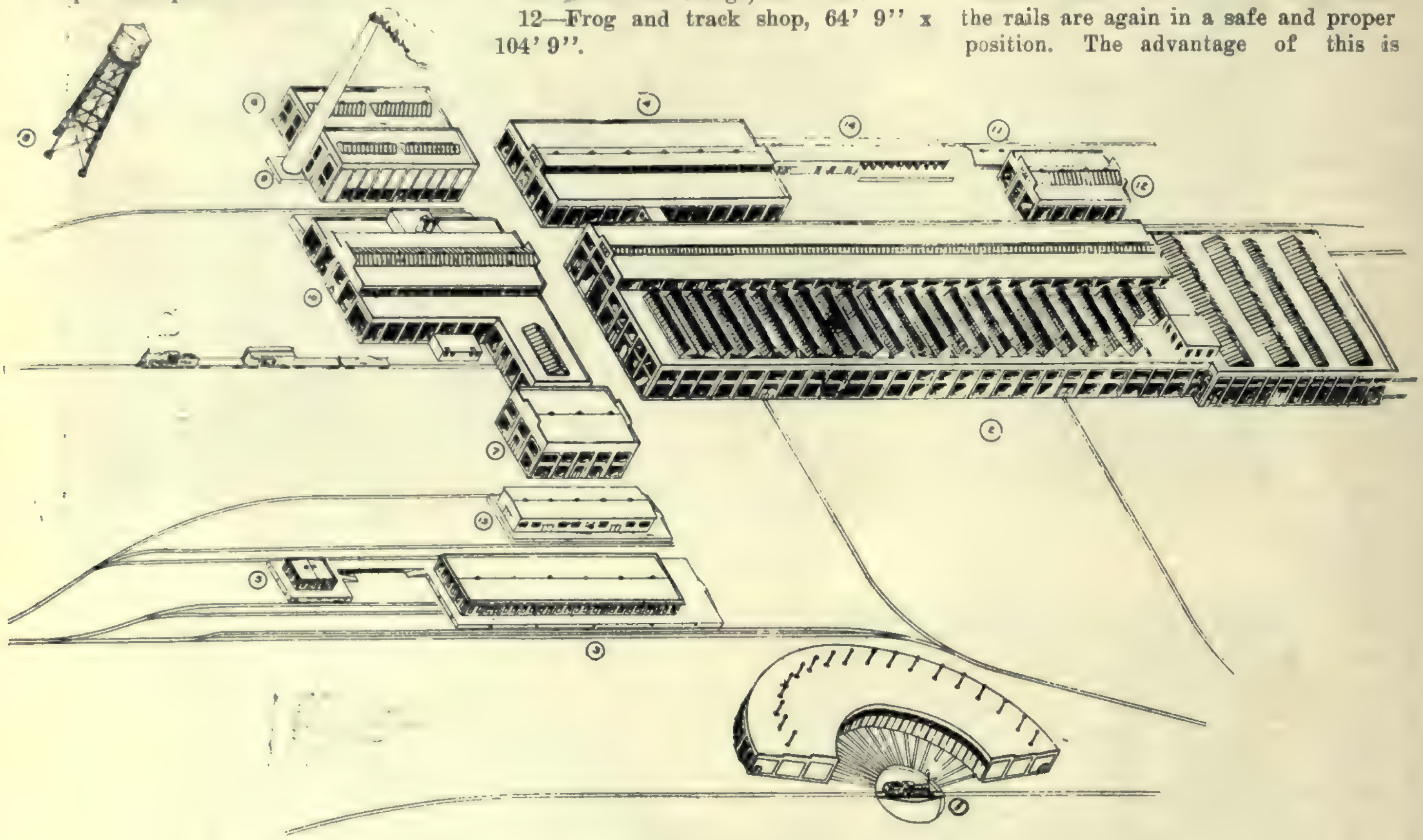
10—Gray iron foundry and brass foundry 204' 9'' x 134' 9'', with cleaning room 64' 9'' x 82' 4½'', sand sheds, coke bins, etc., are also provided.

11—Crude oil storage, 25' x 62'.

12—Frog and track shop, 64' 9'' x 104' 9''.

trouble with the padlocks is that they are being constantly lost or broken, being wrenched off the chain by careless workmen, or becoming jammed with ice or snow in the winter. Another trouble is that the men often leave the key in the padlock, thus placing the safety of the switch in the hands of anyone who may find it.

Mr. Woodhouse's device has the lock inside the switch-post. It will not operate until the point of the rails are in exactly the right position, and once the key is inserted to unlock the rails, it cannot be removed from the lock until the rails are again in a safe and proper position. The advantage of this is obvious. There is no padlock to lose, and the lock cannot be tampered with. Furthermore, by numbering and registering the name of the man who has each key, it can always be told who has left the switch in a wrong position, because he cannot take his key away with him. In this and many other respects, Mr. Woodhouse's invention is regarded as a valuable addition to railway equipment, being also entirely new in principle. The western division of the C.P.R. has already placed seven or eight of these switches in the main line yards at Calgary, where they work splendidly. It is proposed to equip switches throughout the west with this same kind of lock, and the invention is also before the general officials of the company on other parts of the system.



Shops of the National Transcontinental Rail way now in course of Construction at Winnipeg.

NATIONAL TRANSCONTINENTAL SHOPS.

Frequent reference has been made to the N. T. R. shops, Winnipeg, in Canadian Machinery. The accompanying drawing is an isometric view of these shops. The following numbers correspond to those in the illustration:—

1—Round house. The drawing shows a capacity of 18 locomotives, but it was afterwards decided to enlarge it to accomodate 25.

2—Locomotive shop. It comprises tank, boiler, machine and erecting shops being approximately 823' x 174'. The building has 26 engine pits and two transfer tracks.

3—Store house, 62' 6'' x 262'.

4—Forge shop, 104' 9'' x 264' 9''.

13—Stores platform is 56' x 180' and superstructure is 58' x 151'.

14—Forge stores and scrap bins. The iron storage is 30' x 60'; coal, 30' x 30'; coke, 30' x 20'; scrap, 30' x 100'.

IMPROVED RAILROAD DEVICE.

C. P. R. officials have received word from Calgary of the testing of the invention of E. Woodhouse, master mechanic of the western division of the railway, regarding the locking of switches. As is well known, there is at each switch a switch-post with a bar and lever by means of which the rail is thrown from one side to the other, according to where the train is desired to go. When a switch is thrown over it is secured by a padlock and chain. The

MACHINE SHOP METHODS AND DEVICES

Unique Ways of Doing Things in the Machine Shop. Readers' Opinions Concerning Shop Practice. Data for Machinists. Contributions paid for.

TURNING A LARGE THREE THROW CRANK SHAFT.

As everyone knows, who has had any of this sort of work to do, it is not the easiest thing in the world to accurately turn up a three throw solid crank shaft. The writer happened to be in the machine shop of the Robb Engineering Co., recently, and noticed how they used the jigs in turning up a large, eight inch, three throw, crank shaft.

Fig. 1 shows the construction of the jigs or centreing pieces, of which there are two. These are partially split by a ⅜-inch cored slot, which runs to within two inches of the front end. The centreing pieces are held on the shaft by clamping with four 1-inch studs, as shown. It will be noted that the diameter is 1-16 inch larger than the finished shaft on account of the shaft being set up rough turned. The taper plugs are a feature of this jig. These carry the centres for the tail stock spindle, and are easily renewed from time to time as needed.

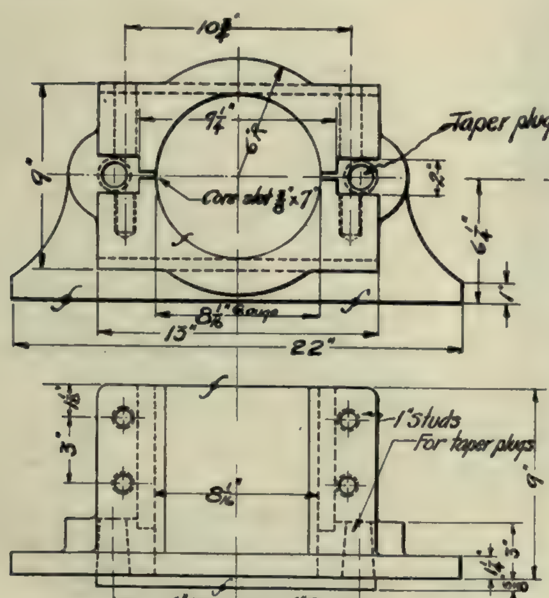


Fig. 1.—Jig for Turning Crankshaft.

Having two centreing plugs in each of the jigs, allows the turning of the pins of a two throw, 180 deg., crank shaft, without readjusting the centreing pieces. The bottoms of the webs in the front of the jigs are scraped absolutely parallel with a line drawn through the centre of the shaft and centres of the taper centre plugs. Fig. 2 is a drawing of the eccentric steady collar. This runs in a steady rest having four adjustable bearing surfaces as can be seen in the photo.

The collar marked "A" in the photograph is marked off accurately in three spaces of 120 degees each and on each of the centreing pieces is a pointer, "B," which engages the marks on the collar. These collars are set by allowing the centreing pieces to rest on the ways of the lathe and allowing the shaft to revolve. In this way the marking off of of the centres of the crank pins by surface gauge is facilitated and then the collars are clamped to the shaft to suit. The use of two collars is helpful in case one is moved in some way while turning and adjusting.

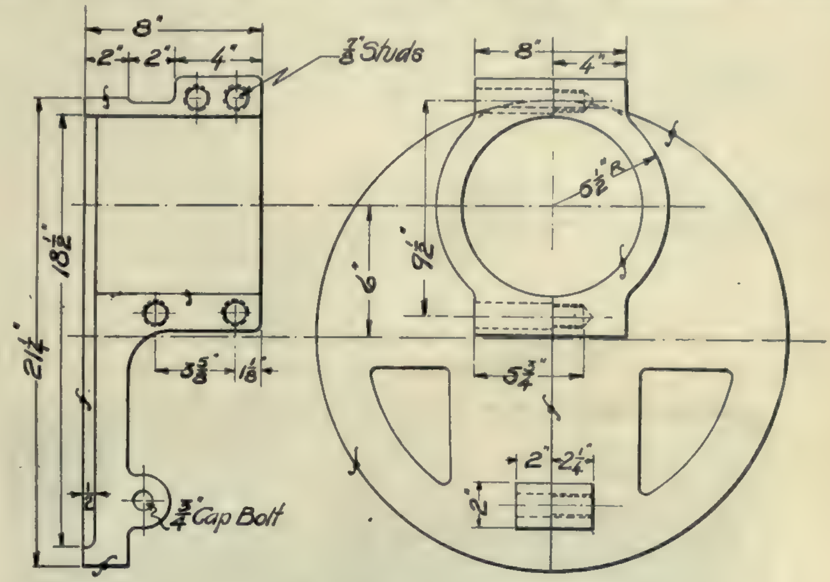


Fig. 2.—Steady Collar.

The two centreing pieces being absolutely identical in every respect allow of adjustment, on the ways of the lathe in setting up, that insures the three crank pins being turned exactly parallel with the shaft.

Fig. 3.—Turning Large 3-Throw Crank.

The pins are first all roughed out to within 1-16 inch of true diameter and then gone over with a light finish cut.

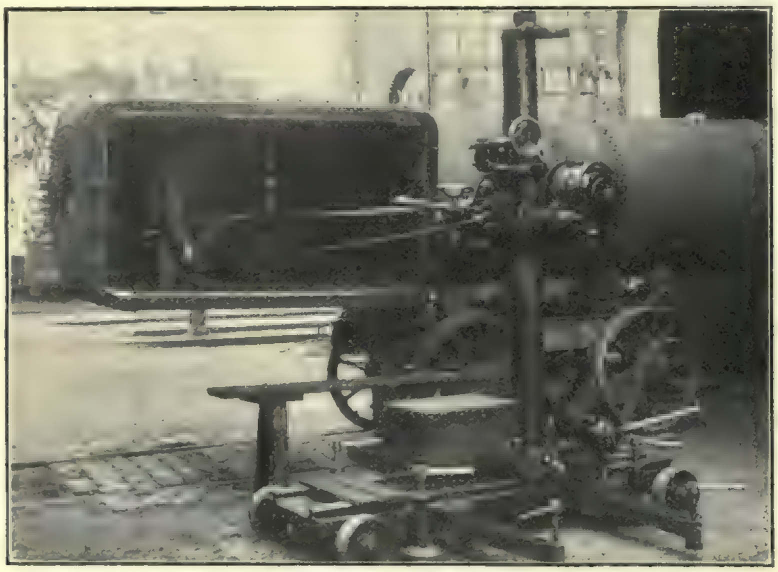
ground and lapped. The reason for the two operations is the fact that in the first the spring of the shaft, due to forging and cooling, is eliminated and the last operation brings the shaft up true and straight. Besides the pins the journals, too, are ground and lapped.

It will be noticed in the photograph that there is a compression grease cup on the spindle of the tail stock. This is very saving on the spindle itself and on the centreing plugs. A 1/4 inch pipe tap is tapped in the spindle and an 1/8 inch hole is drilled from the point to meet this tapped hole. A small groove is also filed on the outside of the cone to provide assistance to the lubrication.

UNIQUE ELECTRIC TRAVELING DRILLING MACHINE.

By Frank C. Perkins.

The construction and method of operation of a novel universal electric drilling and tapping machine of the portable type is shown in the accompanying illustration. This traveling and electric drilling tapping machine is largely used in locomotive works and repair shops as well, as in boiler shops for drilling in frames, boilers, and fire-boxes, as well as in drilling out defective stays.



Unique Electric Drilling Machine.

It affords many advantages over stationary machines, as it is easily transported and placed in service without any preparatory work, and can often be employed in positions where other drilling machines cannot be utilized to advantage. The drilling spindle is driven by an electric motor of two horse-power, through the agency of a double-threaded worm gear and spur-wheels, which can be put in and out of gear and enable the machine to work at four different speeds. The head can be turned round its horizontal axis, and through 360 degrees on the column, which can be moved horizontaly on the carriage.

It will be noted that the complicated and lengthy operation of securing the machine to the work-piece to be drilled is quite superfluous, and in drilling holes of small and medium diameter the weight of the machine affords sufficient stability. For drilling larger holes, and when the head works at the top of the column, the stability of the machine is secured by two arms attached to the base plate. The carriage is fixed on the ground by means of four strong disc screws.

It is of interest to note that the spindle can consequently be set to any position and the machine drills holes up to 60 mm., and with a core cutter, holes up to 120 mm., and taps up to 1¾-inch. The electric motor can be reversed for cutting left and right-hand threads.

The diameter of the spindle is 45 mm. and the feet of the drill is 450 mm. The maximum height of spindle from ground is 2,100 mm., and the lowest position of spindle from ground is 600 mm., while the length of the traveling plate is 1,500 mm. The total weight is about 1,500 kg., and the electric motor is provided with reversing rheostat, cable coil with 10m. cable, plug and socket with flues, and complete electrical connection, which can be readily attached to any power circuit junction box.

It is maintained that the universal drilling and tapping machine is especially adapted for drilling and tapping holes in locomotive frames, as it turns out more work in less time, than older types of drilling machines, and saves the time required for fixing small portable electrical or pneumatic drilling machines. It will be noted that the standard having a longitudinal adjustment, a large number of holes can be drilled without moving the machine.

HANDY AND ECONOMIC TOOL HOLDERS.

By Mack K.

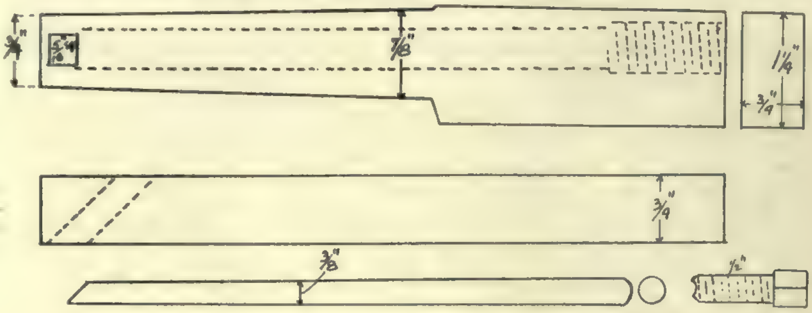


Fig. 1.

The accompany sketch, Fig. 1, shows a tool holder designed first to use boring and threading flanges but is now used in preference to a forge tool on anything within its limit of length.

As shown, the forging is bored pass for 5/8 rod and tapped 1/2 inch. The square hole is cut through at an angle of 30 per cent. This makes threading tool grinding easy, it being necessary to grind one side only of the steel. The push rod is beveled on one end and rounded on the other. The holder and pin are both case hardened all over. An ordinary cup point set screw is used to tighten.

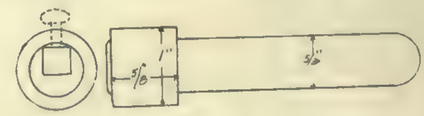


Fig. 2.

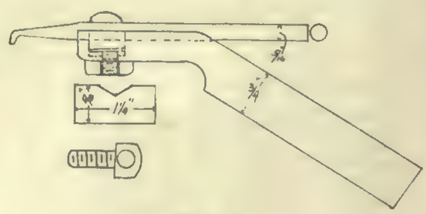


Fig. 3.

In the tool room for grinding these short points a piece of 5/8 round C.R.S. 4½

inches long with a 5-16 inch slot milled 1½ inches in one end, and having a collar with thumg screw on it, Fig. 2 permits of grinding without burning operator's fingers.

The sketch Fig. 3 shows a boring tool holder, using 5-16 round stubbs, of steel, forged to different diameters and styles of points. Offset at an angle of 5 degrees, the holder as shown has a "V" groove planed or milled the full length of the offset. Near the end a 11-32 hole is drilled through and counteredbored 17-32 inch leaving 1-16 inch. The draw bolt is drilled pass, for 5-16 inch round, spring of piano wire and a hexagon nut complete it. It is compact and rigid.

FACING BRASS COCK KEY WASHERS.

By Ethan Viall.

The brass "D" washers used on the small, or lower, end of cock keys, are usually cast in the shape wanted, and

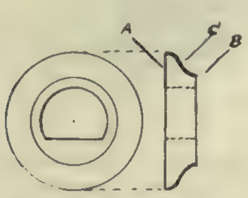


Fig. 1.—The Two Faces.

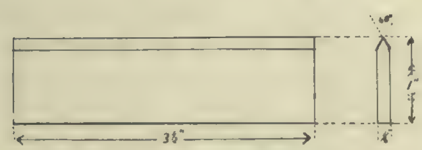


Fig. 2.—Steel Blades.

then machined all over. The hole is cored small and then drifted or broached out in a small press. After the hole is broached out the two faces A and B, Fig. 1, are next machined by being placed on a stub mandrel in a special lathe, the machining being done with steel blades similiar to Fig. 2. These blades are made of either self hardening or high speed steel, and are one-eighth of an inch thick, three and one-half inches long and when new are one inch wide, with a 60 degree cutting edge ground on one edge.

Fig. 3 will give an idea of the special machine and the way these cutters are used. In this cut D is the brass washer, which is placed on the stub D-shaped mandrel, mounted in the special cap F. The blade E is clamped securely in the sliding tailstock, and is fed up to the work by means of the handle G. The knurled nut H is used as a stop. It will be noticed that the blade is placed high in the clamp. This is done when the blade is first put in, and as it dulls it is lowered far enough to bring sharp edges against the work. On ordinary brass work a blade will last about three hours before it needs regrinding.

With the form of stub mandrel, and spindle cap used, a boy can put on or take off a washer without stopping the machine. In order to more easily obtain a uniform thickness, one side of an entire lot of washers is usually faced off, the stop adjusted, and the other side finished. On these washers only sides A and B, Fig. 1, are machined on this machine, as surface C is not machined off until after it is in place on the assembled cock, when it is placed in a special lathe and turned with a forming tool.

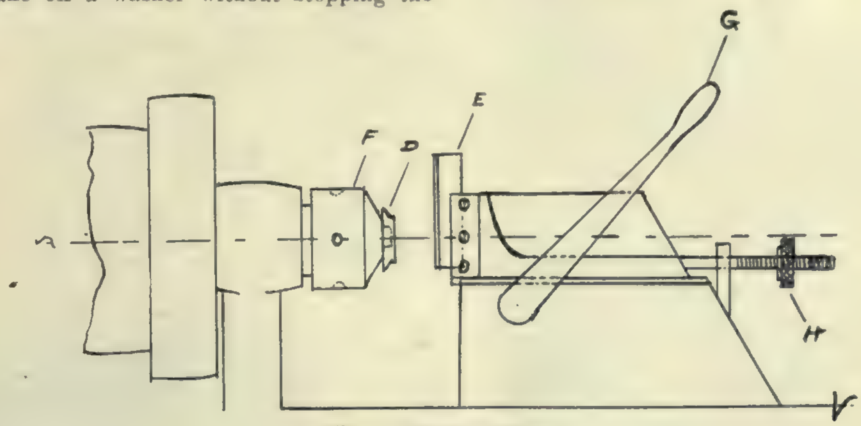


Fig. 3.—Special Machine.

A cutting edge with a 60 degree angle has been found to give the most satisfactory results on these washers, as there is little tendency to chip out or to chatter on the cut.

For grinding, a jig shown in Fig. 4 is used. Very little clamping effect is needed to hold the blade, so only a single thumb screw is used. The lower part of the jig is extended out under the edge of the blade in order to do away with the tipping effect, while grinding.

A jig in which both sides of the edge could be ground without removing the blade was at first planned, but was abandoned for various reasons. When the blade gets narrow, a small parallel is placed between its back and the bottom of the slot in the jig.

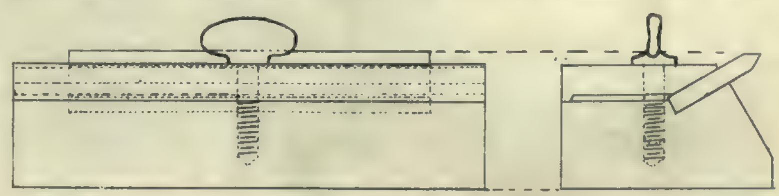


Fig. 4.—Grinding Jig.

To grind the blades in this way, a special guide, Fig. 5, is used on the grinder. In using this, the jig holding the blade is placed against the guiding strip L, and run back and forth under the emery wheel, which revolves in the direction shown. As the wheel cuts, the guide is gradually raised by means of the screw K, which is turned by the left hand while the right moves the small jig back and forth.

It isn't necessary to have the cutting edge absolutely central with the stock of the blade, so this edge is usually centred approximately by the eye, or by turning the screw K a certain amount for each side.

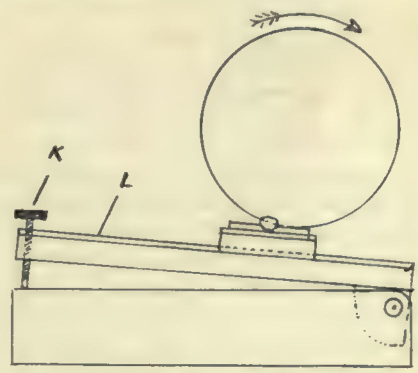


Fig. 5.

The cutting power of paper revolving at a high rate of speed will be surprising to those who have not seen such experiments conducted. A circle of good quality stiff paper about eight inches in diameter mounted upon the shaft of a motor rotating at a high rate of speed will cut through cigarbox wood in a fashion that makes the onlookers respect the cutting power of paper for other reasons than having once received a finger cut in carelessly handling wrapping paper.

DEVELOPMENTS IN MACHINERY

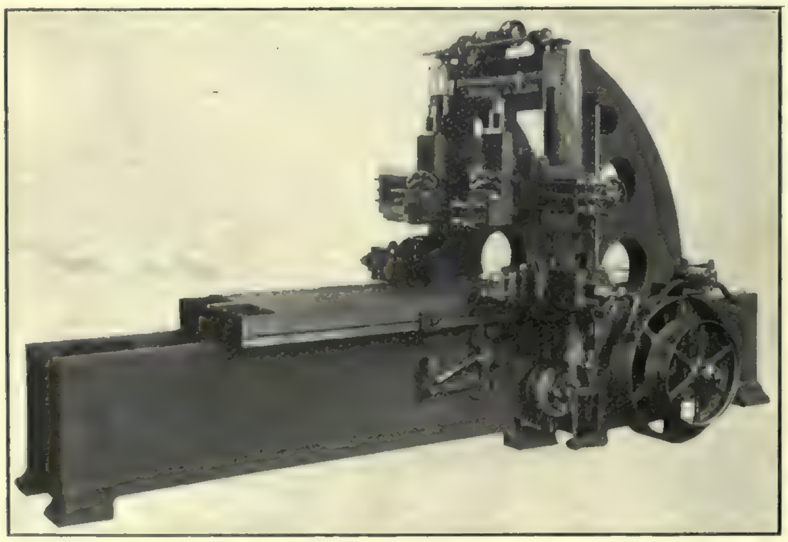
New Machinery for Machine Shop, Foundry, Pattern Shop, Planing Mill; New Engines, Boilers, Electrical Machinery, Transmission Devices.

ROCKFORD 32" PLANER.

The accompanying illustration shows the Rockford 32" x 32" x 8' heavy duty planer, manufactured by the Rockford Machine Tool Co., Rockford, Ill.

The gearing in the drive is located inside the bed between the bearings. The bearings are long straight bushings accurately fitted into holes bored directly in the bed castings. Ample means are provided for perfect lubrication. The belt shafting device is very simple and reverses the table without shock or jar. The heads on cross-rail, also the side heads, have horizontal, vertical and angular feeds. The down feed to the heads on rail is 12". The feed friction is of the combination releasing type. It will carry the heaviest feeds without slipping, and will not run hot. The feeds are changed by the knob shown on the front of friction, a pointer indicating the feed obtained at the different settings. With this device, the feed can be changed for the finishing cut after roughing a piece of work and returned for the next casting, and the operator will know exactly what feed he is going to get without making several adjustments, counting the clicks of the ratchet, etc.

The different parts of the machine are very accurately fitted, and are interchangeable. Side heads can be furnished at any time. Ample means are provided on all bearings for adjustment for wear, taper gibs being used throughout. All bevel gears, pinions and feed racks are made from open hearth bar steel.



Rockford 32" Planer Equipped With Four Leads.

JEFFREY STORAGE BATTERY TRUCK.

The accompanying illustration shows a new yard truck just brought out by The Jeffrey Mfg. Co., Columbus, Ohio. The electrical equipment, including storage batteries, motor, controller, with all necessary charging instruments, are all located below the platform, so that the truck can be used for carrying material of any kind, or for hauling yard cars. The design is such that it can be used on any gauge from 18 inches up, and on the shortest curves encountered on industrial tracks. The electrical equipment is furnished in sizes to suit the service.

For loads up to 10 tons a 6 H.P. motor with 10 K.W. battery is provided. For heavier service, larger motors and batteries are supplied, depending on the maximum loads and the frequency of the trips. The platform is made removable, allowing easy access to the electrical equipment.

Jeffrey Storage Battery Truck.

For the service usually encountered around the average manufacturing plant, moving raw material, castings, etc., the 6 H.P. equipment will operate two or three days on a charge.

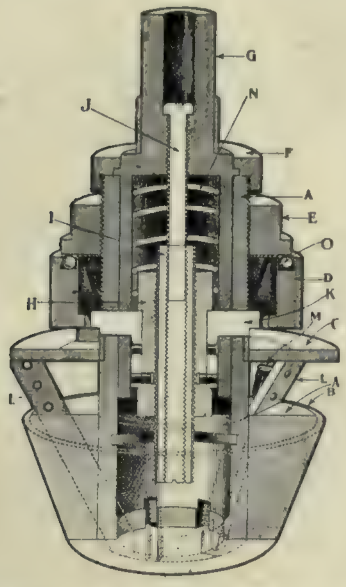
By estimating the average weight and average length of trip the proper size equipment can be determined. The use of these cars facilitates the handling of material around a manufacturing plant, and also effects a very material saving in the cost of this work.

SELF-OPENING DIE HEAD.

A new self-opening die head has been placed on the Canadian market, the invention of W. Richmond. It contains many good features which recommend it to those in need of opening die heads for drills, threading machines and lathes.

The illustration shows the construction of the die head. A is the main body of die, B is a cone-shaped ring which fits over A and retains chasers in place, C is a plate with three stops to rest against ratchet D. D is ratchet ring with groove for trip K to travel in. E is adjusting nut threaded to fit shank of A. F is trip nut threaded to fit shank of A, G is the driving shank made to slide easily in body A, with two keys to drive or hold die. H is trip plunger and is a stop screw. J is a screw for adjusting trips. K are the trips. L are the chasers. O are balls between nuts E and ratchet D. M is chaser plunger, with spring not shown. N is the trip plunger.

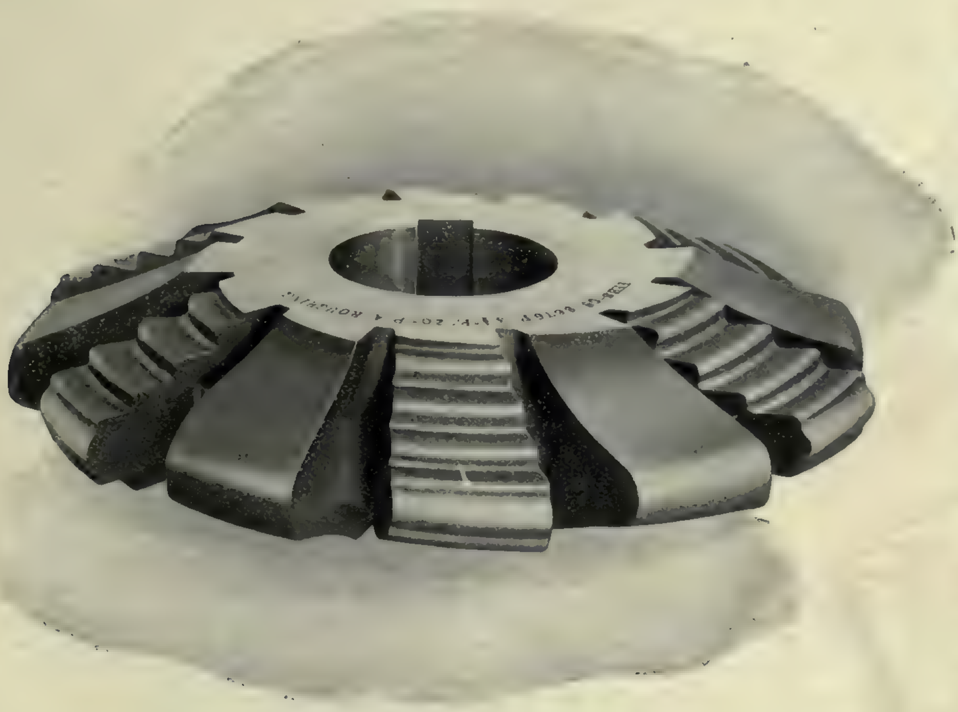
Wortman & Ward, London, Ont., who are manufacturing the die heads and placing them on the market, use them on



Wortman & Ward's Self-Opening Die Head.

a turret lathe for threading and on drill presses. The drill press die head is tripped from the plunger. On the turret, it can be tripped from plunger, turret stop or by pulling back the turret slide.

One of the best features is that it allows cutting up to a shoulder. When the teeth of the chasers are worn, grind off



Brown & Sharpe Stocking Gear Cutter.

dies and they are again ready for use. In Wortman & Ward's works these die heads are used for threading cylinder, caps, pump plungers. All these are cut up to a shoulder. They are used also for bolt work. Teeth can be recut from eight to fifteen times. They are made with 4, 5 and 6 cutters. In threading cylinders, a roughing cut is given and by putting in operation a second cylinder a second finishing cut is given.

STOCKING GEAR CUTTER.

The formed cutter shown herewith is intended for stocking and roughing out the teeth of gears. It is of unusual construction, as may be seen, in that it is made up of alternating plain and stepped teeth. This construction has the advantage that it closely conforms to the shape of the finished tooth space, thus leaving little to be removed by the finished cutter; and at the same time breaks up the chip, so that high speeds and feeds can be used without subjecting the cutter to great strains or heating. It is superior in this respect to both the plain formed cutter and to the design in which all the teeth are stepped.

The cutter shown is an unusually large one, being 13 inches in diameter and being intended for cutting teeth of 1 diametral pitch. In spite of its size, the way in which the chips are produced enables heavy cuts to be taken without undue strain on the teeth or the driving clutches.

The cutter was made by Brown & Sharpe, Providence, R.I.

PORTABLE JIB CRANE.

The portable jib crane described in this article was designed by a master mechanic on one of the large railroads. It may be placed in any position on the floor by overhead traveler in a moment's time, and will handle loads without any manner of assistance from traveler. Not only is labor of men engaged on a given job rendered more ef-

Whiting Portable Jib Crane.

ficient, but the time of traveling crane is conserved most effectively. On account of flexibility of location, this portable crane is destined to become exceedingly popular among railroad men as an auxiliary service crane.

The work handled by this crane in railroad shops includes the removal of driving boxes, eccentric straps and eccentrics from driving axles, and after repairs have been made, of refitting these parts to the axles. All work in connection, such as putting up the collars, sponging boxes and bolting the eccentrics and eccentric straps is done under the crane, and driving wheels are ready to place under engine. One of these cranes will serve a shop handling 60 engines a month for average repairs. One-third the time of the traveling crane is available for other operations, which could not be performed by one auxiliary crane, thus greatly increasing the commercial efficiency of the more expensive tool.

This portable crane can also be used advantageously in locomotive boiler shop, and for handling pneumatic gap riveter or staybolt breaker. In machine shop for assembling tools and for handling heavy vise work, etc.

The crane consistes of a heavy base plate and structural pillar attached thereto, and having a swivel plate on top on which rotating jib is pivoted. A movable trolley is provided which supports a block and hook. A weight attached to opposite end of jib balances trolley and part of load. Jib is stayed by tension rods. Strut for same contains eye bolts for clevis loop by which

crane is lifted and transported by overhead traveler.

Hoisting gearing is attached to base plate or structural pillar, and is operated by pneumatic or electric motor, or hand power. Swinging and trolley travel are operated by hand power. Capacities range from 1,000 lbs. to two tons, with effective radius of about 10feet.

Kalux Hardened Chisel Driven Through Boiler Plate.

These cranes are manufactured by Whiting Foundry Equipment Company, Harvey, Ill.

KALUX, STEEL HARDENING SOLUTION.

For the hardening of carbon or tool steels the Metal Hardening Solution Co., Granite Building, Rochester, N.Y., is introducing a liquid chemical preparation known as "Kalux." It is emphasized that it is only for carbon or tool steel. Air hardening steels naturally have no use for it, and machine steel or iron cannot be hardened by it.

The action of hardening is produced by the shock caused when heated steel is immersed in a liquid of a much lower temperature than itself. This shock can only be obtained where carbon is present to a greater or less extent, as is always the case in tool steel, and cannot be looked for in other classes of steel or iron, where, although carbon is present, it is in graphitic or some other form, which does not respond to or expand to the same extent that the carbon in tool steel will. The action of any hardening bath, such as water or brine, on machine steel can have no effect whatever unless potassium cyanide or some other such chemical is used, and then the effect is only the surface, or penetrates but slightly, producing what is known as case hardening.

The percentage of solution required for the bath depends somewhat on the grade of steel to be tempered. The higher grades of carbon steel require less solution—½ ounce per gallon of water is sufficient—while the very lowest grades may require as much as 2 ounces of solution per gallon of water. The correct amount to be used can only be determined by experiment in any particular case. It is always allowable, however, to quench the tools at a lower temperature than that which is customary. It is emphasized that Kalux is a liquid, not a powder; that it contains no cyanide of potassium, nor yellow prussiate, and that the process of using it is not a complicated one. In tools of heavy stock, such as dies, lathes and corrugating tools, etc., the temper need be drawn only enough to relieve the strain. Longer life and better service from carbon steel tools are the benefit derived by the use of the solution. The cost of the bath all prepared with Kalux ready for use is about 6 cents per gallon, where the medium grade steels are in general use.

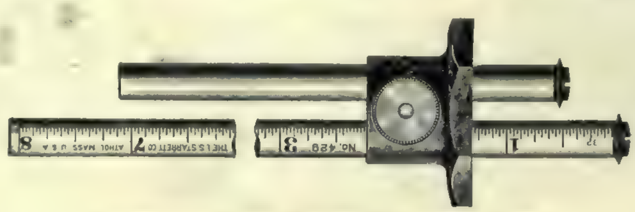
One testimonial received by the company, states that among other tools treated was a circular forming tool for an automatic screw machine, which previous to being treated by Kalux had required grinding at least three times a day, but after treatment it would go for three days without grinding. The material operated upon was 3-16-in silver steel and the cutting speed was 80 ft. per minute. The tool was made of Jessop's steel. Another user found that drills that before would not go through certain stock could do so after being tempered in Kalux. The same shop tested a blanking die, which was used to stamp out small pieces of tempered spring steel. It was found to be still in good condition after 10,000 operations.

The method of hardening steam drills where "Kalux" steel hardening and tempering solution is in use, is to heat tool to a light cherry, then shape, size, and sharpen in machine (where one is in use.) By this time, the steel is about low cherry. The tool is then dipped deep in a bath prepared with "Kalux." Then stand on a rack with about ¾" of steel in the solution, where it is left to stand until all color is gone. Local conditions, such as the kind of rock to be drilled, and the grade of steel in use, may make a slight change necessary, but as a rule the above method will secure the best results.

CARPENTER'S AND PATTERN MAKER'S GAGE.

The head of this gage is made from steel with octagon shaped periphery, case hardened. Two 5-16 in. bars, one plain, 4 in. long, and one graduated in 32nds of an inch, 8 in. long, with sharp rotating cutters on the ends, slide through the head. Either is adjustable in relation to the other, and may be used to make two marks at once, or by slipping one back into the head, out of the way, the other bar may be used for single lines.

The gage is nicely finished, having but one fastening screw to hold both bars with a frictional pressure, or to firmly lock. It is made by L. S. Starrett Co., Athol, Mass.



Patternmaker's and Carpenter's Scratch Gage.

D. Smith, formerly shop foreman on the G.T.P., at Rivers, Man., has been appointed locomotive foreman at West Fort William, in charge of the locomotive and car works at that point, vice W. P. Agnew, resigned.

POWER GENERATION AND APPLICATION

For Manufacturers. Cost and Efficiency Articles Rather Than Technical. Steam Power Plants; Hydro Electric Development; Producer Gas, Etc.

LEATHER BELTING.

By K. Campbell.

In discussing a paper on the transmission of power by leather belting H. J. Hathaway of the Tabor Mfg. Co. gave some interesting data in relation to belt drive.

If a machine stands idle during working hours while the belt is being repaired or tightened it produces nothing during that time, and there is a distinct loss to the manufacturer. If a machine stands idle for one-half hour out of ten hours working time there is a lost of 5 per cent. in the output of that machine and if in a shop having 100 machines, 10 machines out of the 100 lose one-half hour each day on account of repairs to belts it amounts to a loss of 0.5 per cent. on the total output of the shop. This feature, however, is probably not so bad as the loss in output due to the machine belts being run so loose that they cannot begin to take the feeds, speeds, and depths of cut for which the machines are designed and that the tools will stand.

Almost every engineer, foreman or superintendent, in attempting to bring up the speeds of his machines to something like what he knows to be possible, has found that such attempts usually result in the belt's slipping or breaking, or the lacing giving out, and knows that where the care of belts is left to the man on the machine, only in a very few cases can the belts be dedepended upon to do the maximum amount of work. Belts of the best quality must be used at proper tension, and they must be kept in first-class condition, and inspected outside of working hours.

Very few machinists or even foremen know how to tighten or lace a belt properly, the amount to be taken out being usually guessed at, and a great deal of time is lost through the machine's standing idle while the cutting and trying is going on. A good machinist has been seen to run a cone belt, which he has made too tight, on "cross cones," i.e., on steps not in line with each other, with the result that it twisted itself up like a corkscrew and was practically ruined.

Another cause of premature ruin of belts is improper lacing, the ends not being cut square and the lacing on one side stretching more than the other, causing the belt to run crooked.

Cemented splices, when properly made, give the best results. Machine lacing, using a spiral wire lacing, while not so good as a cemented splice, is very satisfactory, however, and more convenient, and takes less time for putting on and taking off belts for the purpose of testing and tightening on the belt bench. A belt joined by a cemented splice must be tested and spliced in position, which is not so convenient as on the belt bench, especially in the case of over-head belts.

NEW HARBOR CRANE FOR MONTREAL.

In Montreal, until recently, there has been a good deal of difficulty experienced by shippers and importors of heavy freight, such as steel, boilers, machinery, etc., on account of lack of crane facilities for handling this class.

The Harbor Commissioners decided to overcome this difficulty, and ordered the floating crane shown in the illustration This was built by Vickers, Sons & Maxim, Ltd., London, England. It was to have been delivered in 1908, but owing to the strike in England at that time, work on the crane was delayed. It met with an accident in transport, which further delayed delivery. This occurred when well out to sea. Heavy weather compelled the tug to abandon the crane, which was left to its fate. However, it was picked up later, towed back, overhauled and delivered to the Harbor Commissioners this summer.

The hull, which is non-propelling, is of steel, 200 ft. long, with a moulded breadth of 43 ft. Power is supplied to the winch engines by one vertical boiler. The crane is built to slew in a complete circle, thus giving it the largest possible scope. The extreme radius of the crane is 72 ft. at which point the capacity is 10 tons. At 51 ft. radius the capacity is 75 tons, which is the weight being lifted when the accompanying photo was taken. This is a steel car, weighing 22½ tons loaded with 50 tons of coal and 2½ tons of steel. At this test the radius of the crane was increased to 54 ft., and with the adjustable counter balance on the load side of the crane the freeboard was two feet.

Floating Crane in Montreal Harbor.

The heel of the jib turns on a trunnion and the radius is increased or decreased by the large screw, which can be plainly seen in the latticed member over the large spur gear.

In addition, a portable self-contained grain elevator is supplied. This has a capacity of 2,800 bushels per hour, and is handled by the crane, when desired. The elevator leg is 75 ft. long and is driven by electric power generated on the crane barge itself.

CANADIAN MACHINERY AND MANUFACTURING NEWS

A monthly newspaper devoted to machinery and manufacturing interests mechanical and electrical trades, the foundry, technical progress, construction and improvement, and to all users of power developed from steam, gas, electricity, compressed air and water in Canada.

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Vol. V. September, 1909 No. 9

LOOKING AFTER THE WELFARE OF THE MEN.

There are so many companies and corporations who think of men as mere machines that it is a pleasure to note from time to time companies taking an interest in the workmen who toil for the good of their company. In other issues of Canadian Machinery we have referred to the provisions for the welfare of the men. In our June issue we referred to the men's rooms in the Hamilton Bridge Works, Hamilton.

The McClary Mfg. Co., London, have also provided rooms for the men. The dining room was opened on Saturday, June 19. It is a fine, airy place, about 100 feet square, where the men are provided with hot water and towels for cleaning their hands, and in addition are provided with tea, coffee and the necessary dishes without cost to themselves. The dishes are thoroughly sterilized after each meal. To the other provisions for the men's welfare are added a large number of current periodicals and playing cards for those who feel so disposed, while those more athletically inclined are provided with a quoiting ground. This move is an effort in the right direction to improve the health conditions of the men.

TWO URGENT NEEDS OF THE DAY.

Dr. Charles B. Dudley, in his presidential address before the American Society for Testing Materials, pointed out that more research and conscientiousness were needed in the work of to-day. In view of recent failures of material in large structures in Canada, and the many large buildings under construction, Canadian mechanical men should approach the problems with all the care and knowledge they can command. Employe and employer should unite in increasing the knowledge of materials and in securing the best workmanship.

In his address, Dr. Dudley said:

"The truth is we are using materials in construction without sufficient knowledge. There is crying need for experiment. Testing machines adequate to cope with some of the problems which now confront engineers do not exist. We are increasing sizes and constantly building larger structures. The factor of safety everywhere is largely a guess. We can not help feeling that no better use could be made of some small fraction of the millions that have been accumulated in connection with our great industries during the past half century than in the establishment of a Bureau of Engineering Research. Who will avail himself of this magnificent opportunity?

"The producer of material is anxious to secure the largest possible amount of successful output and the greatest possible amount of reward therefor. The consumer wants to limit this by restrictions as to quality, and to obtain the material at the lowest figure. The workman's interest is to secure the maximum of pay for the minimum of effort, and in this struggle it may perchance happen that the quality of work suffers. The employer's interests are clearly the reverse of the workman's, and so on. The foundations of these diverse interests are, of course, very deep, and with the present organization of society, it is not easy to see how they are to be obliterated or their antagonism neutralized. But, we beg to make one suggestion. Would not an infusion of genuine conscientiousness into our industrial life bring an amelioration? If a little less energy was expended in the mad race for wealth and a little more zeal manifested in maintaining the rugged virtues of honesty, integrity and fair dealing, would not some of the friction and contention of our present commercial life disappear? We must all live together, and surely harmony is better than contention. There are some things in life of more value than money."

MUNICIPAL ENTERPRISE.

Toronto owns a marsh containing several hundred acres, known as Ashbridge's Bay. After a great deal of strenuous kicking by two or three, the sale of 26½ acres has been made to the National Iron Works for $37,400.

The present council of Toronto is to be commended, for Ashbridge's Bay has been a source of much talk for the past twenty or thirty years. It is recalled that the iron furnace now located at Hamilton desired a site in Ashbridge's Bay, when R. J. Fleming was mayor. The same dog in the manger opposed the sale and Hamilton benefited by not only the iron furnace, but also by other companies which followed the iron furnace. Hamilton is to be commended for the enterprise in securing it.

With Toronto the same opposition has been going on since that time and now that a broader policy has been adopted, it is hoped that it may be continued and that Toronto may be an example to other municipalities in giving companies fair treatment in the sale of sites at a reasonable figure.

It is well known by men who know anything about financing new companies that, if the ground is leased, it mitigates against the sale of their bonds. If the opposition to the sale of Ashbridge's Bay were taken through the swamp, which is at present a breeding place for mosquitoes and bacteria, in a punt or canoe, they would, no doubt, be willing to give it away for the improvements that will be made. Many other cities would be willing to give the site as a bonus in return for the taxes and

for the employment which the works would give to hundreds of workmen.

We do not approve of giving companies large bonuses, but the broad policy now adopted by Toronto will be an example to other municipalities who wish to secure new industries.

GIVE HIM THE HORSE LAUGH.

If you have anything in your system work it out. Don't be afraid to stand up like a man and tell your boss or the head of your department just how you feel, writes Mike Kenny, in the Gimlet.

But for goodness sake don't sulk—don't pout—don't throw things around—don't pull down the corners of your mouth. Don't get in a dark corner with the other fellow and tell him all about it. That's the way cowards act.

If you are not afraid, if you know your reasons are good, if you know you are right, then you should not hesitate to stand up and give your boss the "straight goods."

Generally when a fellow sneaks around and mumbles to himself he is in the wrong and he knows it, and when he tells a fellow clerk his side of the story, he does not tell it straight.

May the good Lord deliver us from grouchy people—from the man who beckons to you to come with him under the stairs and then whispers his troubles in your ears.

If there is a man of this kind in your works, when he gives you the secret signal to come into the dark corner, give him the horse laugh. Tell him you live out in the sunshine, where the work is done and where you can do an honest day's work.

TREND OF TRADE IS UPWARD.

Canada's trade is booming again, and at the present rate of growth will soon reach the highwater mark of a couple of years ago. The total trade of the Dominion during the first four months of the present fiscal year, which is to the end of July, approached the two hundred million mark, totalling $191,919,304. Of this $111,791,842 was merchandise entered for consumption, a gain of $22,377,301. Dutiable goods were entered to the amount of $66,028,887, a gain of $13,810,834 and free goods entered were valued at $45,762,945, a gain of $8,566,467. Duty was collected to the amount of $17,855,948, an increase of $3,633,440. Exports of domestic produce totalled $73,398,595, a gain of $6,193,585.

For the month of July alone the trade of Canada totalled $56,250,000, a betterment of $7,500,000. In this month there was a gain of $9,500,000 in Canadian exports, and an increase of $7,500,000 in articles entered for domestic consumption.

The bank statment for July, as compared with the statement for June, indicates continued growth and expansion of trade throughout the Dominion. Deposits increased by $7,229,621. Current loans in Canada increased by $4,608,772, and call loans in Canada by nearly $2,000,000. Loans outside of Canada decreased by $1,219,115, thus indicating the continued withdrawal of funds from the United States to meet the business demands of the Dominion.

An astounding improvement is to be noted between the current statement and the statement for July, 1908, the aggregate deposits having increased during these twelve months by $122,000,000.

A comparison between the statements for July, 1908 and 1909, respectively, follows:

	July, 1908	July, 1909.
Current loans in Canada	$525,271,185	$539,821,041
Current loans elsewhere	23,153,095	32,753,385
Call loans in Canada	40,467,165	54,603,054
Call loans elsewhere	54,915,935	114,685,537
Deposits payable on demand..	164,791,398	222,555,749
Deposits payable after notice	402,964,565	466,337,816

Official figures of Canada's pig iron output for the first half of 1909 are not yet obtainable, two of the largest producers still withholding their figures. From United States sources, however, estimated figures have been published, and while these are not always trustworthy, they seem likely to be accurate on this occasion.

According to the estimate referred to, the production for the first half of 1909 is the largest of any previous six months by twelve per cent., the figures being 349,641 tons in the first half of 1909, as compared with 311,046 tons in the last half of 1907, the best previous record. In fact, the first six months of 1909 totals more than the production of any whole year up to 1905. The outlook is for an equally good record during the balance of 1909, and it is probable that the figures for the year will exceed 700,000 tons.

TOPICS OF THE MONTH.

Toronto's National Exhibition this year opens on August 30th, and lasts for the following two weeks. It is hoped that the mechanical men, generally, will take advantage of the cheap rates and will visit the exhibition. It is a liberal education, to see the various exhibits and to mix with the people, and the visit will broaden the outlook for all those who attend from smaller places. Machinery Hall will contain factory equipment and machinery that will make it well worth the cost of attending.

* * *

The thirty-eighth annual meeting of the Canadian Manufacturers' Association is to be held in Hamilton, on September 14th, 15th and 16th. A number of most important matters are listed for consideration. The last day for receiving notices of amendment will be August 25th; nominations for the offices of president, vice-president, the executive council, and the various committees will be closed on August 31st; and all proposed resolutions must be submitted to the secretary before noon, September 15th.

* * *

Some excitement was caused at the Victoria Machinery Depot, Victoria, B.C., recently, by the discovery of an infernal machine in the tool box where the boilermakers store their tools. In a yeast tin, powder, rivet heads and iron filings were placed with matches arranged with the heads placed so that the slightest friction would explode the powder and scatter the missiles. The bomb was found by a boilermaker, who took off the top to investigate, and, miraculously, the thing failed to explode. No trace was found of the maker, nor can C. J. V. Spratt, manager of the Victoria Machinery Depot, the police or others, give any explanation of the reason for placing the bomb in the tool chest. As far as can be learned there is no trouble among the men employed in the shops. If the person responsible for this is caught an example should be made of him. We cannot afford to have the lives of our workmen or the property of manufacturers at the mercy of men without consciences.

FOUNDRY PRACTICE AND EQUIPMENT

Practical Articles for Canadian Foundrymen and Pattern Makers, and News of Foundrymen's and Allied Associations. Contributions Invited.

The Work that is Applicable to Permanent Molds

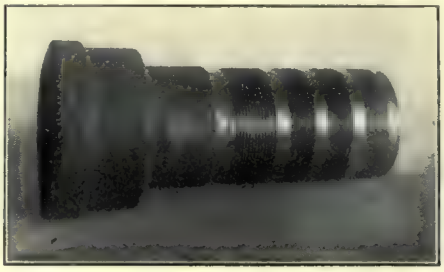
Second Part of Paper read before A.F.A. Convention in Cincinnati by Edgar A. Custer—First part Appeared in August Issue.

We have found that a good casting can be made in a cold mold without any trouble, provided the mold is perfectly dry. But the tendency of the iron to condense moisture from the atmosphere while heating up is so great as to make it almost impossible to get a good casting unless the pouring is done rapidly, so that the mold will be filled before the moisture is deposited upon the face of the mold. In a perfectly dry atmosphere, with a cold mold, the iron pours readily and makes a fine casting. The only reason it is desirable to have molds warm is that they will then keep perfectly dry. We would much prefer to do all our work with a mold at a temperature of not more than 125 to 150 degrees F. As a general rule the first casting is not a very good one, but after the casting has warmed up the mold, there is no further difficulty.

In order to preserve an even temperature in the mold it becomes necessary to put weight into it and pour the castings at such intervals that the temperature will not rise over a certain number of degrees. For instance, we found that casting a four-inch pipe, weighing 65 pounds, into a mold weighing 6,500 pounds every seven minutes, does not raise the temperature of the mold to more than 300 degrees. This matter of heating depends altogether upon the thickness of the casting, and the molds must be designed with that particular point in mind.

That a permanent core can be used in a great many cases has been shown. The use of this permanent core is necessarily limited to castings in which the core is either in a straight line or is in a regular curve. Combinations of straight lines, such as in T's or Y's, or double T's or double Y's, or straight pipes, are especially adapted to this feature. When the core is in the shape of a regular curve, or combination of a straight line and regular curve, it can be made in two or more pieces and easily withdrawn from the casting. This can be done in the case of L's, or sweeps. Irregular curves or cores that would be destroyed in removing them from the casting are, of course, not possible.

We have found that the best metal for these cores is ordinary cast iron, and that the same method of procedure must be carried out for the core as with the mold. There is plenty of time to remove the core and open the mold and yet have the casting without any hard spots. The use of permanent cores suggests the possibility of a machine for duplicate work that is to be made in large quantities, and this machine can be practically automatic in its operation. Pipe fittings, chain links, elevator buckets might possibly come under this class. This is, perhaps looking rather far into the future, but it is the logical outcome of the successful carrying out of the principle involved.



Thread from 8 to 32 per in. Cut on Pipe Cast in Permanent Mold.

Removing Large Cores.

Another point: It has been found easy to remove a five-foot core in the manufacture of cast-iron soil pipe. It should be just as possible to remove a 12-foot core from a water-pipe. It is only a question of apparatus large and powerful enough, and removing at the proper speed. Cores made of steel and wrought iron have been tried, but give very poor results. The cast-iron cores require considerable attention for the first few pourings, to prevent burning and distortion, but after a few castings have been made the iron seems to become seasoned, and after 50 or 100 castings have been poured, very little care need be taken in regard to overheating the arbor or burning it by the impact of molten iron.

Soft cast iron seems to be the best medium for both molds and cores. It cracks less, and is not liable to distort as is the case with a casting made of low-silicon or very close iron. It may be that this is due to the fact that a high-silicon iron melts at a much higher temperature than iron containing a low percentage of silicon, and consequently requires a higher temperature to reach the point at which it softens.

The conclusions arrived at as the result of these investigations may be summarized as follows: Any casting that can be poured in a sand mold can be poured in an iron mold. If the iron is hot enough to run in a green sand mold it will surely run in an iron mold. Iron that is suitable for radiators or fittings, or brake shoes, or any other class of duplicate work that is made in the sand, will be suitable for the use of permanent molds. The same experience that shows the foundryman what is best for sand molding can be utilized in permanent mold work. It is true that a somewhat wider range of iron can be used in permanent molds for the same class of work than is the case in sand molding, but any change from the general practice in selecting irons for any particular class of work must be made with a great deal of care. It is, of course, a subject that demands close and incessant study, and every manufacturer who wishes to use permanent molds must give the same care and thought to this method that he gave to previous methods employed. When the high-class engineering and technical skill is applied to the permanent mold that has been devoted to the molding machines now in use, we may expect to see some very wonderful developments in the foundry line.

Temperature of the Iron.

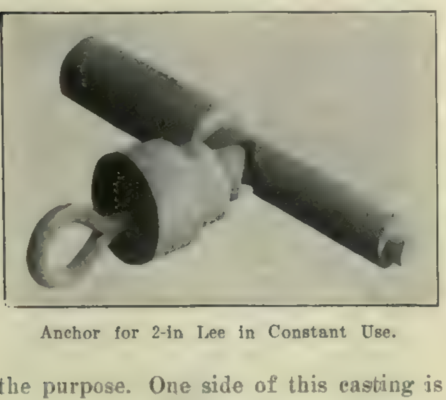
There is one more feature that has not been touched upon, and that is the temperature of the molten iron. In all cases, when using permanent molds, the iron as it comes from the cupola should be very hot, and should never be allowed to stand any length of time before pouring. The first element it loses in cooling is carbon, especially if there is considerable silicon in the original charge. Iron at 2,100 degrees F., with 2.5 per cent. silicon, will not hold as much carbon in solution as it will at 2,400 degrees F., and it is the carbon we wish to preserve. In fact, it is almost impossible to make a very thin casting in an iron mold, with iron containing 2.75 silicon and low

in phosphorus and sulphur, unless the iron is very hot. Our work has shown us conclusively that the best results are obtained with iron containing over three per cent. carbon and about two per cent. silicon. Again, the higher the temperature of the initial iron, the more time there is for the removal of the casting, and the longer shrinkage is delayed. The importance of hot iron is therefore evident, although there is but little loss of carbon when the silicon does not exceed 2.25 per cent., and ordinary diligence is used in pouring.

Prevent Sticking to Mold.

Some care must be exercised to prevent the casting sticking in the mold. It is sufficient to coat the mold occasionally with a mixture of thin oil and graphite. There is no virtue in any of the many coatings recommended other than keeping the molds smooth and preventing the castings from sticking. None will prevent chilling, unless laid on in such quantities as to form a substantial wall of inert material. The writer has used almost every available substance in an infinite number of mixtures, with but indifferent results. Mica, lithophone, clay, graphite, molasses water and clay, paraffin with any number of materials, have been tried, but one and all require a coating at each cast, which is out of the question in rapid work. A thin solution of wood alcohol and shellac, thickened with finely-ground clay, when applied to a slightly warm mold will usually prevent chill, but here again the mold must be cleaned and recoated for each casting. Silicate of soda when fused to the mold has but a very short life, and amorphous phosphorus has an entirely undeserved reputation in the line of chill prevention. The best way to prevent a chill is to take the casting away from the mold before the chill sets in.

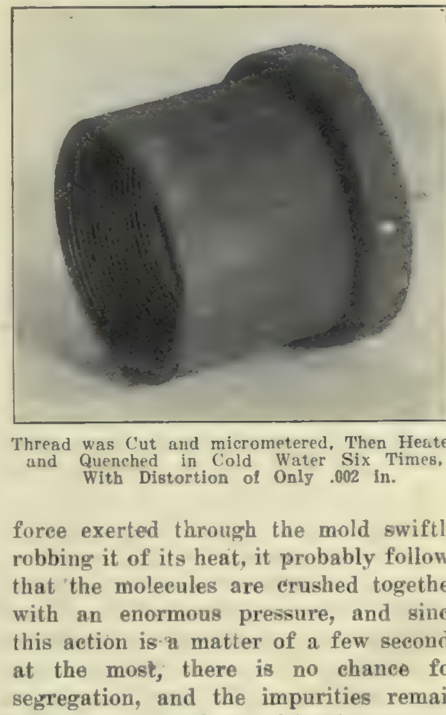
That this chilling does not take place until after the iron has been set sufficiently to handle is demonstrated by a small sample casting made especially for



Anchor for 2-in Lee in Constant Use.

the purpose. One side of this casting is soft and the other is chilled. The casting has been broken to show the effect. You will notice that the quality of the iron in the unchilled portion is of the highest character, and the facility with which it can be machined is shown by the section of pipe on which some threads have been cut. This sudden chilling to the point at which the molten iron sets produces an iron that is nearly homogeneous as it is possible to obtain. That it is entirely free from shrinkage strains is shown by this casting that was taken from the mold at a bright red heat and thrown into cold water. It is absolutely sound and free from all cracks, surface or otherwise.

Now, what peculiar molecular action is set up that produces this result in an iron that when cast in sand exhibits all the defects we are accustomed to see in sand molding? To get at this explanation we must begin with the great unmeasurable force of heat contraction and expansion. No one knows how many tons per square inch is exterted when molten iron cools. This force is always greater than the tensile strength of the material under treatment. If, now, molten iron be subjected to this enormous



Thread was Cut and micrometered, Then Heated and Quenched in Cold Water Six Times, With Distortion of Only .002 in.

force exerted through the mold swiftly robbing it of its heat, it probably follows that the molecules are crushed together with an enormous pressure, and since this action is a matter of a few seconds at the most, there is no chance for segregation, and the impurities remain in the same relative position in the casting that they occupied in the molten iron. That this peculiar action continues after the casting has been taken from the mold is shown by the small globules of iron that have been squeezed from the casting as it cooled. It is further shown by this bar of $1\frac{1}{8}$'' iron that was taken from the mold at a bright yellow heat, with the interior still molten. The excrescences on the top were formed as the bar cooled in the atmosphere, and the broken section will show that the bar is of equal hardness throughout.

Now, let us go a step further. It has been found that iron when cast in an iron mold and removed as soon as it

Crack in a Grate.

sets, possesses some unusual properties. For one thing it will take a temper, and when tempered will retain magnetism. If the casting be taken from the mold at a bright red heat and suddenly quenched in cold water, it has all the cutting power of a good high-carbon steel. This result is invariably obtained whether the iron be a high or low in silicon, phosphorus, sulphur or manganese. There is no evidence of what we generally speak of as "chill"—no white crystals are shown; in fact, an iron that chills white first in the mold and is then quenched in water, will not harden in the manner described, but will crumble when applied to the emery wheel.

The fact of the matter is simply that chilling molten iron swiftly to the point of setting, and then allowing it to cool gradually, produces a metal that is entirely new to the art. It has all the chemical characteristics of cast iron, with the exception of combined carbon, and it also possesses some of the properties of high-carbon steel. We have been taught that steel will not take a temper when it contains a very appreciable amount of free carbon, yet this piece of cast iron, that has .44 per cent. combined, and over two per cent. free carbon, has been tempered repeatedly, and will do better service in a lathe than a very good non-alloy steel. Once this peculiar property is imparted to the casting, it is impossible to eliminate it except by remelting. A bar of iron so treated can be held in a flame until the metal drips from the end, and yet quenching will restore it to its original hardness. The analysis of the piece of treated iron before us is as follows:—

Si	2.28
Phos.	1.21
Sul.	.108
Mn.	.41
T. C.	2.05
C. C.	.44

An analysis of another piece shows:—

Si.	2.24
Phos.	1.12
Sul.	1.01
Mn.	.38
T. C.	3.02
C. C.	1.54

It will be noticed that the carbon for the first piece is low—much lower than we like to have it for our general work. But the remarkable feature about this particular phase of the process is that such a close-grained, tough and strong iron should be produced with an analysis such as given above. The analysis of this iron taken after it is removed from the mold, and without quenching, is the same as above, except that the combined carbon is not over .28.

The character of the iron before being quenched, is very fine, close-grained and yet it is easily machined. In all this work there are no blowholes, and any dirt that enters into the piece must come from the ladle.

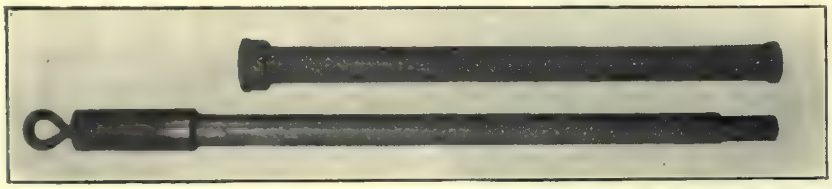
In some of our earlier writings the effect of the carbon in cast iron was exhaustively treated; in order to make clear the chemical changes that occur in in this process, it may be well to repeat some of the conclusions:—

All the carbon in molten iron is in solution, and exists in the combined form. Now, if molten iron be instantly cooled to 1,000 degrees F. all the carbon will be held in the combined form—there will be no free carbon. If, however, it be instantly cooled to the point at which the iron sets, and then allowed to cool normally, the carbon will be in the combined form at the time of setting, but will change to the free form as the cooling progresses. This formation of free carbon is very rapid; the major portion present in the casting is formed within a few seconds after it is taken from the mold. The analyses below give a very fair idea of this action, the pieces in question being 6 x 1¼ x ½":—

	C. C.	T. C.
Cast in sand and cooled normally	.27	3.20
Taken from permanent mold at bright yellow and quenched	1.50	3.02
Taken from permanent mold at bright red and and quenched	.49	3.10

It will be seen from this that two-thirds of the combined carbon has been changed in the few seconds required to cool from a bright yellow to the bright red. The free carbon in all these castings is not in the form of graphitic carbon, as we usually see it in ordinary cast iron, but partakes more of the character of annealing carbon. It is probably this annealing carbon that gives permanent mold castings their unusual strength and toughness.

The difficulties that confront an investigator who attempts to look into the manufacture of castings are so great, owing to the peculiar conditions that surround the art, that much of the information that has heretofore been given is of value only when the local conditions are fully known. Our present-day technical pournals, with their earnest and persistent work, have gone far towards making the foundryman's art a scientific process; but, after all, the sum total of all these efforts has been to seek a remedy for the difficulties encountered, in a process that in itself must of necessity often give unsatisfactory results. Sand as a medium for making general castings will always hold its own. We have discovered nothing that is so cheap and so efficient, considering the vast range of work it is required to do. Its deficiencies are well known; but so far, all efforts to overcome these deficiencies have been solely in the direction of shedding light upon the characteristics of the iron used. We read a great deal about the evils of sulphur and of phosphorus, and we find that these evils are not exaggerated when it comes to making castings in sand. But to my mind, the reason why phosphorus and sulphur are the bane of the foundryman's existence is not because of the mere fact that sulphur and phosphorus are present in the casting, but because in slow cooling in sand molds, sulphur and phosphorus segregate. Therefore, the great evil in cast-iron work is not so much the presence of impurities, but the fact that segregation allows these impurities to mass themselves and thus destroy the homogeneity of the iron.



A 4-in. Pipe and Permanent Core.

Our experiments have shown that an iron containing 1½ per cent. phosphorus when cast in an iron mold is as strong as iron containing .4 per cent. when cast in the same mold. We can find no perceptible difference in the tensile strength under these circumstances. The same is true with sulphur at .1 and sulphur at .03, and it would seem, therefore, that the mere fact of the presence of sulphur and phosphorus in these irons is not deleterious when segregation is prevented.

It is not within the province of the sand mold to prevent segregation, and the remedy can not be looked for from that point; nor is it possible to prevent a certain amount of segregation in a permanent mold when the casting is so thick in section as to make the cooling comparatively slow. Fortunately, most of the duplicate work in this country to which the permanent mold is applicable is comparatively small section—very little of it is more than 1" or 1½" in the thickest part, and when a casting in not thicker than the figures given above, and is made in a mold properly designed, there will be absolutely no segregation.

The formation and segregation of graphitic carbon is familiar to all, and its weakening effect upon cast iron is very well known. The casting made as above described, and containing free carbon that is thoroughly distributed throughout every portion of the iron, and is not allowed to collect in large flakes or bunches, will be as easly machined, and will have greater tensile and crushing strength than a casting made in a sand mold in the ordinary way.

The position the writer takes in this matter is that the evils of phosphorus and sulphur are due, not to the fact that these elements are present in the casting, but to the fact that the slow cooling allows them to collect in masses. If segregation were prevented a high-phosphorus or a comparatively high-sulphur casting would be just as strong as if these elements were low in percentage.

So far, we have discussed simply the use of the permanent mold as applied to the foundryman's art, with iron taken from the cupola. If, then, permanent molds can be used with success in the foundry, and a system of continuous pouring be inaugurated, which in duplicate work would obviate the necessity of having molders, why is it necessary to melt pig iron in the cupola? What could be more ideal than a series of permanent molds supplied with molten iron practically direct from the blast furnace? The interposition of a reheating ladle such as is used by the steel makers of to-day, presents no unusual

features; and this ladle makes possible the treatment of the molten iron. Modern practice has eliminated much of the uncertainty in blast furnace work, and it is not unusual to find these furnaces so equipped as to produce an iron that varies but few points from the quality desired by the foundryman. The molten iron we get from the blast furnace is much hotter than that obtained from the cupola, so that there is every reason tc believe that the castings we would obtain would be of a better quality than when the pig is remelted in the cupola.

In our work we have conclusively demonstrated that it is immaterial whether an iron contains 1.75 or 3% silicon, so long as the molten mass is at the proper temperature, so that the high temperatures obtained from the blast furnace would go far toward offsetting the variations in the impurities. Given, therefore, a furnace properly equipped and properly handled, with the interposition of a reheating ladle, there is no reason why a very high class of work should not be obtained with the use of permanent molds. How far this thought can be carried out lies with the blast-furnace owner.

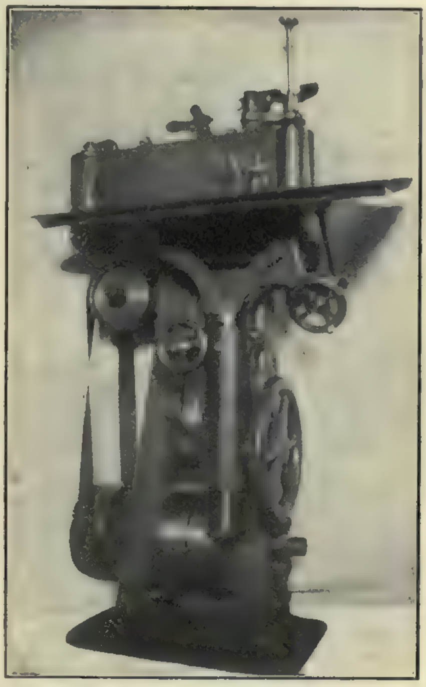
PATTERNMAKERS' POWER TRIMMER.

The proper jointing of patterns is an important part of a patternmaker's work and the machine shown has been designed to assist in making joints of all kinds accurately and rapidly. In the trimmer illustrated a sanded belt replaces knives, the work being held against this at any desired angle by the tilting table in front and its guide. The sanding belt is 6 inches wide, and runs over a metal backing plate, which keeps it perfectly flat while the work is being pressed against it. This belt is automatically moved up and down through a limited range by a very ingenious arrangement of the idler pulley at the left. This is shifted into an inclined position, first one way and then the other, so that the sanding belt is continually traveling up and down, which distributes the wear and insures better work.

The table is 28" x 10" and has an extension that goes around the leading roll, which is very useful for inside circular work. It can finish core boxes to a knife line, with a great saving of time, draw prints, and, in fact, round and square prints can be cut to shape with even draft on all sides. For small core boxes or inside of small circles, there is a spindle on top of the leading roll on which may be turned a special roll for any purpose.

The tension of the sand belt is controlled by a toggle, making it convenient to take off and replace belts. To increase or reduce the tension a knurled nut is close to hand over the toggle. The tension is not rigid, but has a cushion spring in the toggle so that no undue strain need come on the belt.

The table is adjustable vertically and horizontally, all movements being obtained easily and rapidly by handwheel and not requiring the use of a wrench in any case. Careful attention has been paid toward making this as convenient as possible to the patternmaker. It is designed and built by Alfred R. Benn,

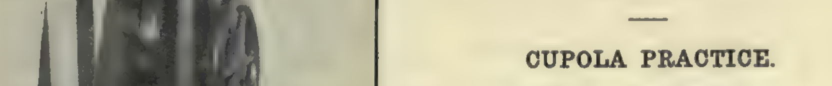


Trimmer Showing Table Adjustment.

1757 Seventy-second Street, Brooklyn, N.Y.

HANDY SHRINKAGE RULE.

A handy shrinkage rule, as shown in the accompanying illustration, has been brought out by the Keuffel & Esser Co., Adams and Third Streets, Hoboken, N.J., and 252 Notre Dame Street, Montreal.



Keuffel & Esser Shrinkage Rule.

It is intended to fill the demand for an accurate, well finished shrinkage rule at a moderate price. The particularly desirable feature of this shrinkage rule is that each of the four edges is graduated in 16ths, instead of in 8ths, 10ths, 12ths and 16ths, on respective edges, as in the case with the old style shrinkage rule. All the edges are numbered from left to right, so that the rule is always in proper position for use. The rule is two feet long, nominal size, the graduations being made in four different scales for 12.1, 12⅛, 12 3-16 and 12¼ inches shrinkage measure, respectively, to the foot.

ANTHES IN THE WEST.

A certain railroad in Western Canada is not yet in very good working condition, and the trains consequently run at a phenomenally low rate of speed. When the conductor was punching his ticket a few days ago, Laurie Anthes, of the Toronto Foundry Co., who is on a trip to Edmonton and other western points, remarked:

"Does this railroad company allow passengers to give it advice, if they do so in a respectful manner?"

The conductor replied in gruff tones that he guessed so.

"Well," Anthes went on, "it occurred to me that it would be well to detach the cow catcher from the front of the engine and hitch it to the rear, for we are not liable to overtake a cow, and what's to prevent a cow from strolling into this car and biting a passenger?"

CUPOLA PRACTICE.

By T. Ben Bennett.

Generally speaking, articles written by foundrymen refer to large cupolas and up-to-date foundries. Now I judge by the questions asked by many foundrymen that a great many of its readers are handling small furnaces in a not too well-equipped foundry. Now the man who can select from his yard the grades of iron laid down by the foundry chemist to make a proper analysis for a line of work and who is melting fifty ar sixty tons in a seventy ton furnace, will not meet with the same kinks as the man who has only one grade of iron (the supposed analysis of which is furnished by the dealer) and a scrap heap and who is trying to melt seven tons of iron in a furnace of five ton capacity.

I believe small foundries require a more all-round up-to-date manager than a large up-to-date one. Large foundries generally have experienced melters, foundry chemists and a foundry superintendent, who is generally a practical man. This relieves the foreman of a great deal of responsibility.

As I am operating a small furnace and have had considerable experience on small furnaces in shops, I thought

my experience might be of help to others who are meeting with difficulties, which I have surmounted. Our melter was an intelligent man drawn from the laborers' gang. He was very anxious to learn and has made a first-rate melter. When he leaves me, which he may do some day, and goes to a larger shop, I shall not try for an experienced melter, but shall do as I have done in the past, take an intelligent laborer, show him that the responsibility of a good heat rests with him; instruct him thoroughly in the method of handling a cupola and I shall soon have another good melter ready for the larger shops, to offer him as an experienced melter, a larger salary that I can afford to pay. I have yet to see a good up-to-date man on a small furnace make a failure of a large furnace, yet I have known good men handling a furnace of sixty tons make a total failure on a small furnace of eight tons.

The furnace I am about to describe is not a model one by any means and could be improved in almost every respect, but it is the furnace we have to melt with.

The Cupola.

The cupola is 36 inches inside the brick lining. We have two linings of brick, the one next the shell is ordinary fire brick, standing on end, flat side to the shell. This is merely to protect the shell. The inside lining is built of circle brick with an ordinary sand bottom, the distance between the bottom and the tyyeres is too great, so that we are obliged to use a nine inch sand bottom, which reduces tne distance to 12 inches. From tuyeres to melting point is about 16 inches, melting zone is about 20 inches, charging door is about seven feet above tuyeres (which is far too low). It has a wind belt five and a half inches by two feet with eight tuyeres 3x3¼ on wind side flaring to 6 x 3¼ on inside.

We use a wind gauge of our own construction. A glass tube is marked off in inches, the water rests at 0' each inch, and as the pressure forces the water up represents 1 oz. wind pressure, the highest pressure we get is about 7½ to 8 ozs. When melting six to seven tons I would use a higher pressure if we nad it. I have experimented considerably as to advisability of early and late lighting of the furnace and have found the following gives the best practical results.

We place on the bottom enough shavings and hardwood cuttings to ensure the coke getting a good start. There are four hundred lbs. of coke. At 1.30 p.m. we light, the shavings. As soon as the coke shows red through the top, we insert a bar through the tuyeres to level the coke down on the bed as the wood burning from under often leaves the coke arched up, which would give trouble when the iron was placed on and the coke settled unevenly. We then charge 300 lbs. more coke (less about three shovels or 50 lbs.) On this 2,100 lbs. of pig iron and 1,100 lbs. of scrap in alternate layers, before putting in the last 600 lbs. of iron we add the three shovels of coke held back and 3,200 of iron. The second charge is 150 lbs. of coke then 1,000 lbs. of pig and 500 of scrap. This fills the furnace to the door. Now it is necessary to note the natural draft through the furnace. If this is necessary, we leave the furnace door open and the tuyere eyes also open. If the draft is heavy and the coke is being consumed too rapidly, we close the tuyere eyes leaving the furnace door open.

The top half of the front is left open, the lighting finished, at 4.15 the wind is put on, and iron appears about 4.25. We allow about 25 lbs. of iron to run from the furnace then we bank it up till there has melted about 800 or 1,000 of iron, when we tap out and begin pouring molds. As the iron melts down the other charges follow at 150 lbs. of coke to 1,500 lbs. of iron up to the full heat of six or seven tons.

Our melting ratio being about 7.56 to 7.80, this gives us a good hot iron which is necessary, as much of our work is very light. We run the iron into a large bull ladle so as to allow a thorough mixing.

In order to handle a furnace successfully a melter must know the weight of his coke and also the displacement in his furnace of a given weight of coke. As the lining burns out and the melting point becomes larger in diameter, we increase the coke on the bed to bring it up to the proper height and also increase the weight of iron charged correspondingly.

Some foremen are having trouble with chilled iron or rather with white streaks of chilled iron running through the grey iron castings. I venture to say that this unexplainable change in the metal takes place in every case in the iron first tapped from the furnace. Up to recently I have had considerable difficulty with this hard iron problem, especially when melting certain grades of pig iron. The cause of this has been ascribed to the sand used in the furnace bottom being too wet, too hard rammed and to a green ladle being used. While this will cause the chilled iron to appear, removing the above causes does not always remedy the difficulty as I have found to my own loss.

After seeing that the sand used is as dry as possible for the purpose of a bottom and that it is rammed properly, I overcome any further difficulty by allowing as much molten iron to collect in the cupola as I can safely handle before making the first tap. My reason for this is, that the first iron melting and coming through the bottom of the coke bed to the more or less damp sand bottom, becomes a mass af small particles of chilled iron. Now the more iron allowed to melt and mix with the first melted iron, which has been chilled in warming the sand bottom, the softer the metal from the first tap should be. Unless the bottom is very wet or rammed far too hard, the hard iron will not appear in any but the first iron drawn from the cupola. Of course a wet boiling ladle would have the same effect as a wet bottom in the cupola, only not so great, as the first ladle of iron will dry the ladle whereas one ladle of iron will not dry the furnace bottom. Some reader may say that allowing the iron to run in a large bull ladle before distributing to hand ladles, as mentioned in the forepart of this article, should have the effect of mixing the metal and overcome the difficulty; but for some reason, which I cannot explain at present, it does not mix in the bull ladle and will show through all the castings formed from that iron. With that grade of iron and with other conditions being normal, the only way that I have been able to get over the trouble is to allow as much metal as is convenient to collect in the cupola before tapping out.

EDUCATION SYSTEM FOR MOLDERS.*

The Association Institute of the Y. M. C. A., Hamilton, Ohio, conducts a class for those now employed in the foundry and teaches them what they ought to know about the trade, things that cannot be learned in a shop.

The course consists of twenty-four lessons and covers the field very thoroughly. Besides taking up actual molding, the methods are fully illustrated. One lesson takes up the trade of molding in general, another bench molding, sand, gaggers, venting, shrinkage, casting special pipes in green sand, how to get castings clean, weighing down copes and skin drying.

Lesson 12 illustrates the many methods of making Corliss and slide valve engines and air compressors. Lesson 13 illustrates methods of making gas engine, marine, automobile and other cylinders.

Other lessons include making of cores, another use of wet blacking, burning, use of flour, rosin, core compounds, etc.; treatment of the laying out of plates for loam rigging, illustrating the making of a plain cylinder; general principles of loam molding and sweeping of wheels in loam illustrating the

*Articles on Technical Education have appeared in March, November and December, 1908; January, February and March 1909, issues of Canadian Machinery.

most modern way of sweeping wheels in halves from two centres by using one spindle only.

Lesson 21 is sweeping a large pump air chamber. Others are on how to find the capacity of ladles, etc.; making permanent molds and finding the weights of castings, cylinders, wheels, weights of castings from patterns, etc.

Mr. James A. Murphy, superintendent of the Hooven-Owens-Rentschler Co. foundry, teaches this class. Mr. Murphy is especially well qualified to have charge of this work. His training, experience and present position peculiarly fit him for it.

Students are especially requested to ask questions pertaining to shop troubles with their work. At least fifteen minutes of each evening is devoted to this part of the work.

Models and blackboards are mostly used. Drawings are also used and the students are taught how to read them.

Winona Technical Institute.

Winona Technical Institute is a group of trade schools, affording instruction in iron molding, printing, lithography, carpentry, electricity, mechanical drawing, civil engineering, machinery, bricklaying, pharmacy, chemistry, house and sign painting, interior decorating and paper hanging and mantel and tile setting.

The foundry school was established for two purposes. One is to broaden the opportunities for young men to learn the trade of iron molding, which are restricted under the old shop apprenticeship system, the other is to draw upon the school for young men to help carry on the foundry business. Another reason for establishing the Foundry School is, in shops where apprentices may be received, the pressure of business is such, that superintendents and foremen are unable to give beginners merited attenti

Equipment.

A Whiting cupola; No. 9 Buffalo blower driven by a twenty-five horsepower motor; a traveling crane supplied with a General Pneumatic Company hoist with a lifting capacity of five tons, traversing the entire length of the building ; a large drying oven of the latest improved type for large cores and dry sand molds, together with portable ovens for drying small cores. The core room, besides other appliances, also contains one Hill-Griffith portable oven, one Millett portable oven, and a Wadsworth core machine of the latest improved type. A Steele Harvey crucible melting furnace is used in melting copper and its alloys. The general foundry equipment consists of one Hanna and one Deane pneumatic sand shaker, the Tabor, Pridmore, Stearns and Cincinnati molding machines, a universal power saw used in fitting up flasks, etc., besides all other appliances necessary to the modern foundry practice. An Ingersoll-Rand air compressor with a capacity of 215 cu. ft. of free air per minute furnishes air for the pneumatic appliances. The cleaning room adjoins the foundry and is equipped with one Farnham sand blast, exhaust tumbling mills, grinders, pneumatic chisels, etc., in fact everything necessary to facilitate the work in this department. The National Founders' Association co-operates with this department in every way.

T. H. C. Homersham, director of Thwaites Bros., Ltd., engineers, Bradford, England, is paying a visit to Canada this month (September) with a view to arranging representation in the Dominion, and studying the requirements of the Canadian market. The manufactures of Thwaites Bros., Ltd., cover a very wide range and include power plant, machine tools and foundry equipment.

LIMIT GAUGES.

The following tables belong to the article on "Limit Gauges" on pages 35 and 36 of the August issue Canadian Machinery. They are fully explained in that number.

TABLE B.

Formulae for extension of tab'es of limits over 6".

Class		
A	High limit	$+\sqrt{D}\times.0006$
	Low "	$-\sqrt{D}\times.0003$
B	High limit	$+\sqrt{D}\times.0008$
	Low "	$-\sqrt{D}\times.0004$
P	High limit	$-\sqrt{D}\times.0002$
	Low "	$-\sqrt{D}\times.0006$
X	High limit	$-\sqrt{D}\times.00125$
	Low "	$-\sqrt{D}\times.0025$
Y	High limit	$-\sqrt{D}\times.0010$
	Low "	$-\sqrt{D}\times.0018$
Z	High limit	$-\sqrt{D}\times.0005$
	Low "	$-\sqrt{D}\times.0010$

For Classes F and P no exact figures are generally useful, as conditions vary so widely as to design.

TABLE A.

Class	Nominal Diams.	Up to ½"	9/16 to 1	1 1/16—2	2 1/16—3	3 1/16—4	4 1/16—5	5 1/16—6
A	High Limit.	+ .00025	+ .0005	+ .00075	+ .0010	+ .0010	+ .0010	+ .0015
	Low " .	- .00025	- .00025	- .00025	- .0005	- .0005	- .0005	- .0005
	Tolerance..	.0005	.00075	.00100	.00150	.00150	.0015	.0020
B	High Limit.	+ .0005	+ .00075	+ .00100	+ .00125	+ .00150	+ .00175	+ .00200
	Low " .	- .0005	- .00050	- .0005	- .00075	- 00075	- .00075	- .00100
	Tolerance..	.0010	.00125	.00150	.00200	.00225	00250	.0030

ALLOWANCES FOR VARIOUS FITS.

Class	Nominal Diams.	Up to ½"	9/16 to 1	1 1/16—2	2 1/16—3	3 1/16—4	4 1/16—5	5 1/16—6
F	High Limit.	+ .00100	+ .00200	+ .00400	+ .00600	+ 00800	+ .01000	+ .01200
	Low " .	+ .00050	+ .00150	+ .00300	+ 00450	+ .00600	+ .00800	+ .01000
	Tolerance..	.00050	.00050	.00100	00150	.00200	.00200	.00200
D	High Limit.	+ .00050	+ .00100	+ .00150	+ .00250	+ .00300	+ .00350	+ .00400
	Low " .	+ .00025	+ .00075	+ .00100	+ .00150	+ .00200	+ .00250	+ .00300
	Tolerance..	.00025	.00025	.00050	.00100	.00100	.00100	.00100
P	High Limit.	- .00025	- .00025	- .00025	- .00050	- .00050	- .00050	- .00050
	Low " .	- .00075	- .00075	- .00075	- .00100	- .00100	- .00100	- .00100
	Tolerance..	.00050	.00050	.00050	.0005	.00050	.00050	.00050
X	High Limit.	- .00100	- .00125	- .00175	- .00200	- .00250	- .00300	- .00350
	Low " .	- .00200	- .00275	- .00350	- .00425	- .00500	- .00575	- .00650
	Tolerance..	.00100	.00150	.00175	- .00225	.00250	.00275	.00300
Y	High Limit.	- .00075	- .00100	- .00125	- .00150	- .00200	- .00225	- .00250
	Low " .	- .00125	- .00200	- .00250	- .00300	- .00350	- .00400	- .00450
	Tolerance..	.00050	.00100	.00125	.10150	.00150	.00175	.00200
Z	High Limit	- .00050	- .00075	- .00075	- .00100	- .00100	- .00125	- .00125
	Low " .	- .00075	- .00125	- .00150	- .00200	- .00225	- .00250	- .00275
	Tolerance..	.00025	.00050	.00075	.00100	.00125	.00125	.00150

NOTE—Run Fits:

Class X is suitable for engine work and other loose fits.
Class Y for high speed work and good average fits.
Class Z for very fine work, tools, etc.

The Tolerance is in each case the difference between the High and Low Limits and represent the working margin.

INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News.

Foundry and Machine Shops.

Hall & Wallace are erecting at Vancouver a $21,000 machine shop.

The Vancouver Furnace Co. are erecting a $2,500 shop and foundry.

The striking Hamilton moulders have taken out a permit for a foundry building.

The Transcontinental Ry. will erect machine shops at St. Perpetue and Baker Lake, Que.

The I. C. R. is calling for tenders for the erection of car repair shops at St. John, N.B.

The International Harvester Co., Hamilton, says that the stock it allotted to its employes has been over subscribed.

The M. C. R. locomotive shops at St. Thomas after being on short time for several months, have started working full time.

The Westminster Iron Works is shortly to make an addition to its building in order to accommodate its growing business.

The Belleville Brass and Steel Works have recently been so rushed with orders that they have found it necessary to work night and day.

John F. Bethune and ex-Chief Engineer Tye, of the G. T. P. are forming a company to establish at West Fort William a steel plant and car-building shops.

The Hydro-Electric Power Commission has made application to the Town of Dundas for the privilege of using the north bank of the Desjardins Canal as a right of way.

At a meeting of the board of directors of the Brandon Machine Works, held recently, it was decided to amalgamate the company with that of the Stewart Nelson company of Winnipeg.

The $100,000 that the directors of the Nova Scotia mine at Cobalt have voted is for the purpose of erecting a twenty-stamp mill with an amalgamation and cyaniding process plant.

The Reid foundry at Ingersoll is likely to be re-opened. Stephen King, a prominent hardwareman of that town, has purchased the property with the prospect of rebuilding and carrying on the business.

The Sherbrooke Construction Co. has the contract for erecting the new C.P.R. buildings at Sherbrooke. The new structure includes a station, engine house, coal chutes, machine shop, and store and oil house.

Arrangements are being made by General Manager Chamberlain of the G. T. P. to give out contracts within a short time for the erection of the company's workshops and roundhouses on the main line just north of Edmonton.

The Belleville Iron and Horseshoe Co., have just closed their first year under the present management and they do this with a good balance on the right side of the ledger, the business having increased every month this year.

Work has commenced on the installation of the electric lighting plant at Ladysmith, B.C. Already the agents have begun to collect the material for the plant, and C. R. Yuill is making preparations for the delivery of the poles.

A. C. Rioux's new machine shop at Claresholm, Alta., has a complete equipment. The power is derived from a 10-horse power gasoline engine. There is no other foundry nearer than Calgary 82 miles to the north, and Lethbridge, 65 miles south.

A fourth copper furnace has been "blown in" at the smelter of the Consolidated M. & S. Company, at Trail. The smelter now has four large copper furnaces and can now reduce about 2,000 tons of ore in 24 hours. It is evident that additional furnaces will have to be installed before many months.

The McGuigan Construction Co. is erecting the towers on the power transmission line between Dundas and Niagara Falls. Two large gangs of men are at work between the two points, and a third has started to build the Toronto line between Oakville and Toronto.

Conditions on the coast appeal so strongly to J. C. and Angus McDonald, of Grand Forks, B.C., that they will move to Vancouver their large steel and iron plant, which has been operated in the Boundary mining town under the name of the Grand Forks Structural Iron and Steel Co.

Russell Brothers, who have been engaged in the McKinnon Dash and Metal Works, St. Catharines, for years, have taken over the Ford & Dickenson plant, in the buildings at the old fair grounds, where they will enlarge and improve the premises, which will hereafter be known as the Russell Machine Company.

Concessions were made by the representatives of the National Iron Works to the Toronto council. In addition to the terms already named the company agree to use the property for their own purposes solely, to spend $100,000 within a year from the date the agreement is signed, and to do their own dredging.

Fort William is to have the first steel dry dock installed at the Canadian head of the Great Lakes. It will be located in McKellar river and will be operated in conjunction with the shipbuilding plant of the Great Lakes Dredging Co.

The Silliker Car Co., Halifax, are now engaged in building steel cars for the Ontario Government Railway. The cars are the first of the kind ever constructed in Nova Scotia. This firm has recently received several good orders for cars and everything is booming at the plant. More than three hundred men are employed by the company, and all the skilled men who apply are taken on.

L. D. Barchfield, representing John Patterson, of Hamilton, and the interests that electric railway promoter represents, says that definite information with respect to the Galt-Hamilton Electric Railway may be expected any day. All the money required for the enterprise has been raised and both the Guelph and Galt lines will be built at once. It is expected that construction work will start in a few weeks. As a very large force will be put on it is believed that the road will be finished within one year.

Plans for the establishment of iron and steel works in the vicinity of Vancouver, representing an investment of nearly three million dollars, are considerably advanced. The proposed enterprise is being initiated by James A. Moore, a well known Seattle capitalist, in conjunction with prominent local capitalists. It is the intention of the promoters to draw their supplies of raw material from the vast iron deposits at Quatsino sound, Vancouver island, and from Texada island. Construction work, it is expected, will be started early next year.

A company has been formed at Vancouver to take over the business of McDougall & Jenkins, boiler-makers, machinists and engineers of Victoria and Vancouver. The new company, to be known as the McDougall-Jenkins Co., will erect a plant which will be unsurpassed in the province. Machinery will be installed to enable the plant to handle all kinds of shipping and general engineering work, which is on the increase here just now. The former members of the firm will be retained. The council of North Vancouver will give the company special consideration in the way of freedom from taxation for a period of years and a supply of water at a nominal rate.

Since the rolling mills at Belleville closed down a few weeks ago for necessary repairs great improvements have taken place in the plant, several thousand dollars having been spent in improvements. An additional engine has been installed to take the place of the high speed engine running the fans. The old high speed engine is now in the power house where it will be used in running a generator. A new set of bar rolls has been added to the 18-inch mill. New rolls have been placed in the 12-inch mill. The 9-inch mill has been completely overhauled and new roughing rolls and new roughing plates and feed rolls added. The furnaces have been rebuilt, the boilers inspected and retubed and many other necessary repairs were completed. The mills started full blast with a large staff last week.

It is reported that the London Electric Co. is figuring on buying water-generated power to fight the city's Niagara power plant. It is said the company is carrying on negotiations with the big electrical merger, which holds a charter for a line from Hamilton to Brantford, and Brantford to London. The merger will sell power to consumers and will supply the London Electric with current from the Cataract Power Co. at Hamilton or from the big private plants at the Falls.

The Power Committee of the London City Council have recommended for acceptance tenders for a considerable quantity of equipment required for the distribution station. The contract for poles was given to the Bissell Company, of Toledo. The same firm got the contract for cross arms, the London Bolt & Hinge Co. obtained the contract for braces for $423.90, and for bolts, etc., for $317.88. The wire contract was awarded to the Wire & Cable Co., Montreal, for $9,292.50. The Northern Electric Co., Toronto, was given the contract for pins for $320, and the Locke Insulator Co., New York, was awarded the insulators for $640.

Municipal Undertakings.

R. S. Low has the contract for installing sewers at Sydney, C.B., at $20,000.

The municipality of Richmond, B.C., is planning for a water supply system.

Work has been commenced on the new $20,000 waterworks system at Francis, Sask.

The B.C. Government have decided on the expenditure of $35,000 on waterworks improvements.

Bids will soon be asked for the construction of the proposed sewer system at Barrie. Probable cost, $30,000.

Montreal's Finance Committee has decided to vote $17,000 for the purchase and laying of water pipes in that city.

Laurie & Lamb, Montreal, have been awarded the contract for a Heenan refuse destructor for the city of Westmount.

New Westminster's waterworks scheme is estimated to cost $378,000, of which Richmond municipality will contribute one-third.

Ratepayers of Notre Dame de Grace having voted $350,000 for public improvements, about $125,000 of this will be expended on sewers, work to begin this fall.

The North Sydney, C.B., Town Council have decided on the extension of the sewerage system on Margaret Street. Work will be proceeded with at once.

Broley & Martin have secured the contract for constructing the pipe line from Fairy Creek to connect with the present Fernie, B. C., waterworks system. Work will be commenced at once.

New Westminster, B.C., ratepayers will shortly be asked to approve of a by-law to raise $234,000 for waterworks improvements, and $104,000 for street improvements, the latter amount including a large sum for street lighting.

The contract for a new steel tower at the Shelburne waterworks, to replace the present wooden trestle and tank, has been awarded to the Jenks-Dresser Co., Sarnia, at $4,325, for a 60-foot steel tower and steel tank of 100,000 gallon capacity.

The Regina Waterworks Committee accepted the tender of the Canadian Iron Corporation, Fort William, for 1,710 tons of 18-inch pipe at $40 per ton, 122 tons of 6-inch pipe at the same price, f.o.b. Regina, and 8 tons of specials at $65 per ton. The contract for valves was given to the Canada Foundry Co., Toronto, and the contract for lead piping, curb braces ,etc., to James Robinson, of Winnipeg.

Victoria will undertake a large number of sewer works which have been held up. At a recent meeting of the Streets, Bridges and Sewers Committee, the list of works was passed and work on the construction thereof will be proceeded with at once. The cost of the works will aggregate $40,825. There is now at the disposal of the city for sewer purposes about $60,000.

N. T. Cooper, chairman, of Clinton's (Ont.) Waterworks Committee, writes that contracts for waterworks have been awarded as follows: Pipe laying, T. M. Cullen, Huntsville, prices ranging from 18 cents to 30 cents per foot; cast iron pipes and special castings, Gartshore-Thompson Co., Hamilton, $32.20 per ton; construction of 80-foot stand pipe and foundation, Hunter Bridge & Boiler Co., Kincardine, $5,000.

The Montreal Water Committee have awarded the contract for 50 additional feet of concrete conduit to the shore end of the present conduit to P. McGovern, the present contractor of the conduit, for $9,950. The contract for six-foot steel piping to run out into the river for a distance of 60 feet, was awarded to the John McDougall Caledonia Iron Works Co., for $2,788. The contract for a sluice gate was awarded to the Coffin Valve Co. for $1,485.

Railway Construction.

The C.P.R. will spend $130,000 on terminal improvements at Sherbrooke.

Construction work has been begun on the last section of the Chilliwack extension of the B.C. Electric Ry.

The Montreal and Southern Counties Electric Railway will connect St. Lambert and Longueuil with Montreal.

The Lindsay Construction Company is to build a branch railway from Nictaux Falls, N.S., on the H. & S. W. Railway to the mines at Torbrook.

Berlin ratepayers have approved a by-law to raise $49,000 for double tracking a section of the street railway track between Berlin and Waterloo.

The C.P.R. will spend $75,000 on improvements at Aroostook Junction, N.B. Tenders for the extensions, which include a six-stall engine house, turntable and pit, will be opened shortly.

The B.C. Electric Railway Co. will shortly call for tenders for the grading and track-laying on the Lynn Valley extension. It is hoped to have the extension in operation this autumn.

The C.P.R. will likely construct a line on the east side of the Fraser River from Cisco Flat coastward for 65 miles. This will give that railway a line on both sides of the Fraser. The route is also sought by the G.T.P. and C.N.R. for entrance to Vancouver.

A deputation of English capitalists visited Chatham recently, and in company with the directors made an inspection of the Windsor, Essex and Lake Shore Railroad. If they can be induced to put up the capital they talk of doing the road will immediately be extended to Chatham, and later it is the intention to build it on to London.

James J. Hill has men surveying the Crow's Nest coal field district, north from Flathead County, Montana, and there was filed with the Secretary of State a resolution by the directors of the Great Northern, announcing that company's intention to build northward into Saskatchewan.

The Canadian Northern have decided to construct a new main line to Edmonton, using their Winnipeg-Brandon-Regina route as the first section. From Regina the Prince Albert branch will be utilized to a point near Craik; from there a new line will be built crossing the South Saskatchewan at the Elbow and running northwesterly to Edmonton, and on to the Pacific.

The following plan of railway extensions in Alberta has been approved of by the Minister of Railways Canadian Pacific line from Langdon to a point 45 miles north and then to a point on their line between Penhold and Red Deer, and of the Canadian Northern from Strathcona southwest crossing the Calgary and Edmonton line just north of Red Deer, passing near Red Deer, and south to Calgary, and also of the G.T.P. from Riley on the main, southerly to near Pound Hill through Camrose, passing near, but west of Content and close to Three Hills, south of Calgary.

The survey work for the new Victoria and Barkley Sound Railway is progressing satisfactorily under the charge of C. Hoard, the engineer in charge. The new line is to go around the head of Esquimalt Harbor near the J. H. Todd cannery to Parsons Bridge, thence to Sooke Harbor, and so on up the coast to Barkley Sound. This railway will tap a very rich country both from an agricultural standpoint as well as the heavy timber, which alone will afford traffic for the railway for years to come. The construction and completion of this line will mean much to Victoria.

Electrical Notes.

Coaticook, Que., intends spending $17,000 on an electric plant.

The Ottawa Electric Co. will build a $20,000 addition to their Chaudiere power house.

Kamloops council is considering having a 35 arc light system instead of a 25 arc system.

Sherbrooke intends adding 1,700 h.p. to its plant on Magog river at a cost of $50,000.

The Manitoba Telephone Commissioners have 3,000 applications for permission to build rural telephone lines.

John Hayman, London, has the contract for the erection of the $40,000 Hydro-Electric power station at Dundas.

The rate of motor power on small motors in Lindsay has been reduced $15 a year by the Lindsay Light, Heat & Power Co.

The Bell Telephone Co. is planning to place its wires in London in conduits the cost of such work being estimated at $50,000.

The transformer station of the Cataract Power Co., at Dundas, was destroyed by fire recently. The damage is placed at $45,000.

Mr. Acres, hydro-electric engineer, stated that the work on the Dog Lake falls storage dam at Port Arthur was to be commenced at once.

The British Columbia Electric Co. has awarded to Malcolm & Dinsdale the contract for an addition to its plant at Victoria at a probable cost of $50,000.

The first sod of the Canadian Light, Heat and Power Company's new plant at St. Timothee, Que., was turned recently by the Hon. Rodolphe Lemieux.

The construction of a line to convey electrical energy for light and power has been commenced at Welland. The destination of this line is Fonthill and Pelham.

The Verdun, Que., council is considering the advisability of negotiating a loan of $150,000, the proceeds to be used for the installation of an electric light plant.

The Vancouver Power Co. has made application for power rights on the Indian river, and also ask permission to use 150 cubic feet per second from another stream flowing into the Indian river.

The Automatic Telephone Co. will install equipment at Lethbridge and East Calgary at the instance of the Alberta Government. Several other cities will also probably be similarly equipped during the summer.

The Simcoe Railway & Power Co. will soon proceed with the development of the Big Chute on the Severn river, thirty miles from Midland. It is expected that about 4,000 horse power can be developed and distributed in that vicinity.

The Dufferin Light and Power Co. is completing its transmission line from Shelburne to Orangeville, and installing a 100 k.w., single phase transformer at Orangeville. They are also increasing the generating equipment at Horning's Mill.

The machinery for the new steam power plant, which the B. C. Electric Co. is installing as an addition to its present steam plant on Store Street, Victoria, has arrived from Vancouver. The foundation has been laid for the new structure at a cost of about $20,000.

The establishment of an artificial ice plant at Montreal is the plan of a number of the local ice dealers to offset the advantage given J. T. Ewart by the leasing of the ice field about Sugar Loaf Island. The Montreal Light, Heat and Power Co. is behind the scheme.

Tenders will be called shortly for the construction of the hydro electric plant at Bracebridge, for which the ratepayers voted $45,000. Construction will proceed at once so that power may be delivered before December 1st. C. H. & P. H. Mitchell, Toronto, are the engineers.

The Wentworth county council recently passed a by-law giving permission to the Cataract Power Co. to erect a transmission line from the Horning mountain, along the Ancaster stone road, to the Binkley hill, and thence to Dundas. This construction has been necessitated by the destruction of the sub-station at Dundas recently.

The contract between Ville Emard, Que., and the St. Paul Electric Co. for the pumping of water from the city aqueduct has been slightly improved from a taxpayer's point of view. Hitherto the price paid was $2,000 per annum, but in future the work will be done at a rate of 4c. per 10,000 gallons.

The Montreal Light, Heat and Power Co. has announced that reductions will be made after October 1 next, in the charges for the supply of electric light. This is being done, on five-year contracts only, by increasing the rate of discount to thirty-three and one-third per cent. on every account irrespective of the amount of the bill.

Bids were recently received by J. H. Truesdale, city clerk, for one 500 k.w., 2,200 volt, 60 cycle, 150 r.p.m. two-phase generator, exciter and switchboard installed complete, and a 750 h.p., 150 r.p.m. vertical Corliss engine, with necessary condensing apparatus, installed complete. The contract has been awarded to the Allis-Chalmers-Bullock Co. Cost $6,860.

The Electric Light & Power Co. of North Hatley, Que., have been making extensive improvements in their plant on the Massawippi river, and when the work is completed the tail race will have a head of 19 feet, fully doubling the power at the disposal of the company, which supplies electric lights to many neighboring villages.

The Nipissing Power Co. is constructing a power plant on the South river, 19 miles south of North Bay, to supply North Bay and vicinity with electric power. The entire electrical equipment is being supplied by the Canadian Westinghouse Co., and the turbines by the Jenckes Machine Co. The president of this company is C. B. Smith. It is expected that power will be delivered in North Bay in December.

The Provincial Government at Regina has awarded the contract for the completion of the long distance telephone line from Saskatoon to Prince Albert to J. S. Bartleman, of Regina. The line will be completed by fall.

The Ridgeville Electric Light Co. are endeavoring to secure contracts for lights. They want enough business to pay running expenses and interest on their money. The company will secure their juice from the Falls Power Co. of Welland.

The formation of an electric lighting company and installation of an electric lighting plant in Shediac, N.B., is now practically assured. It is estimated that about $15,000 will be required to do the work. Competent engineers have estimated that the power obtained by damming the Scoudouc will be sufficient not only for lighting the town but also for supplying electricity for manufacturing purposes.

Active construction work on the proposed dam to be built across the Coquitlam river by the B.C. Electric Railway will soon be commenced. The object is to secure a greater head for power purposes. This company has also applied for water rights on Indian river, a stream of water emptying into the north arm of Burrard Inlet, a few miles from the site of the present power plant at Lake Buntzen.

It is reported that the London Electric Co. is figuring on buying water-generated power to fight the city's Niagara power plant. It is said the company is carrying on negotiations with the big electrical merger, which holds a charter for a line from Hamilton to Brantford, and Brantford to London. The merger will sell power to consumers and will supply the London Electric with current from the Cataract Power Co. at Hamilton or from the big private plants at the Falls.

The Nipissing Central Railway, which is to build an electric railway connecting Cobalt, Port Cobalt and Haileybury, expects also to furnish electricity for lighting. The company has an authorized capital stock of $1,000,000, and the officers are: J. W. Fitzpatrick, North Cobalt, president; P. L. Utley, Escanaba, Mich., vice-president; A. Jones, Haileybury, secretary; R. G. Stack, treasurer, and Clarence B. Henry, North Cobalt, electrical engineer and general engineer.

Engineers are engaged at the present time in surveying the Iroquois Falls on the Abittibi River, about twenty miles north of Matheson, said to be the greatest in the north country, with the object of ascertaining the feasibility of generating sufficient energy to electrify the T. & N. O. Railway. Twenty miles from the falls is where the Grand Trunk Pacific Railway crosses the Abittibi River. More than 5,000 horse power can be developed. Possibly the development could reach a maximum of 7,000 horse power.

A large contract has been secured recently by John Booth & Sons, constructional engineers, Bolton, through their London agent, D. C. MacCurrach, of Queen Anne's-chambers, Westminster. This was the order for the steelwork and erection of a generating station for the Northern Light, Power and Coal Co., Dawson City, in the Klondyke, who are starting a large electric plant, to supply light and power to the surrounding mining district. The material has been forwarded by the new route across the Isthmus of Tehuantepec, Mexico, to Salina Crux, where it will be reshipped and carried up the Pacific by special steamer to Skagway, Alaska. It will then be transferred to the White Pass and Yukon Railway for transit to White Horse, at which place it will be loaded into barges and towed 400 miles on the Yukon River to Dawson City.

A party of Owen Sound's leading financiers visited Eugenia Falls at Flesherton, recently, to ascertain the feasibility of harnessing the falls and supplying Owen Sound and villages in the district with electricity. Work with this object in view was begun four years ago by the Georgian Bay Power Co., the leading stockholders of which belonged to Toronto. In all, it is claimed, that company expended between $80,000 and $90,000 in purchasing rights and constructing a tunnel. Then the company came to the end of its resources and the work was brought to a standstill. Various engineers have reported favorably regarding the scheme, stating in effect that it would be possible to supply Owen Sound with 2200 horse-power for a ten-hours working day at a rate of $20 per horse-power. The present cost in Owen Sound is about $43. The idea at present is to consider the advisability of completing the work commenced by the Georgian Bay Power Co. To do this it will be necessary to invest a sum of about $200,000.

Structural Steel Notes.

Peterboro is advertising for tenders for the construction of the Smith Street Bridge.

The Stratford City Council are considering the erection of a new bridge over the Avon at Waterloo Street, to replace the present structure. The city engineer will submit plans.

Coaticook Council has accepted the Quebec Provincial grant of $2,000 towards an iron bridge to be known as the Beet Factory Bridge, across the Coaticook River, according to Government plans and specifications.

Work will shortly begin on the erection of the new steel framework for the Sherbrooke Stadium. The contract has been let to the Jenckes Machine Co., and the rink will be completed in time for skating in December.

The Algoma Steel Bridge Co., of Winnipeg, has secured the contract from the Rural Council for the erection of a steel and concrete bridge across the river at Macdonald, Man. The bridge is to be 30 feet in length and will cost in the neighborhood of $2,000.

The E. & N. Railway are to construct a bridge across Arbutus canyon. The bridge will be 1,500 feet in length, will take a year to complete, and will cost over $100,000. This is only one of the many improvements which will be done by the C.P.R. on the E. & N. Ry. which they have taken over.

The plans for the new bridge to be erected over the Don at Wilton Avenue, Toronto, the money for which was voted by the property owners, have been completed by R. Chadwick, who has charge of the bridge branch of the City Engineer's Department. Its total length between abutments will be 370 feet. About 500 tons of steel will be required to construct the bridge, which it is estimated, will cost $100,000.

The new steel and concrete bridge which was being built across the River de l'Isle, near Alexandria, collapsed recently. The bridge, which had a span of ninety feet, was being constructed by the Chatham Bridge Co., after plans prepared by M. J. McLennan, C.E., of Williamstown. The steel work of the bridge was in place, and the men putting in the concrete expected to finish their work in another two hours, when the first hint of trouble came in the buckling of the girder at the centre of the span, and the whole structure swayed to one side, finally settling down about four feet till it came to rest on the pier of the old bridge, which had been left in place. The specifications called for a bridge to sustain a weight of fifteen tons, in addition to its own weight. Including approaches, the total cost was to be four thousand dollars.

Planing Mill News.

A large planing mill will be erected at Montreal by Friedman Bros.

The Beaver Lumber Co. have purchased a site at Portage la Prairie for the extension of their plant.

The Chaleur Bay Lumber Company's mill in New Brunswick has been damaged by fire to the etxent of $100,000.

Fire totally destroyed the sawmill belonging to the Hocken Lumber Company at Otter Lake, Ont., on August 12.

The Mundy Lumber Co., Three Valley, B.C., will rebuild at once the mill recently burned and put it again in operation.

A new sash and door factory is to be built at Victoria, provided the necessary permit can be obtained. Burdick Bros. are the applicants for the permit.

The B. F. Graham Lumber Co. has announced its intention of constructing in the near future a sawmill with a daily capacity of 100,000 feet at Victoria.

Captain Mellon and associates will shortly erect a new shingle and lumber mill on Howe Sound, near Port Mellon, B.C. The mill will have a daily capacity of 20,000 feet of dressed lumber, ond 100,000 shingles.

D. G. Cooper is preparing to erect a new sawmill at Collingwood, on the site of the one destroyed a couple of years ago. A complete mill has been purchased on the North Shore, and will be removed and erected in Collingwood at once. The firm will be incorporated as the Kent-Cooper Co. It is expected that a couple of million feet of logs will be cut this fall.

Amalgamation is announced this week of the British Canadian and Western Canadian Pulp and Paper Companies, having offices in Vancouver and Victoria respectively. The former has a plant nearing completion on Howe Sound, while the property of the latter is on the west coast of Vancouver Island. According to present plans, the plant at Howe Sound will be manufacturing within a month or two.

Trade Notes.

The Waterous Engine Works, Brantford, have been awarded the contract for a new sewerage pumping station there at $3,313.

Ross & Howard, Vancouver, have the contract for supplying the four big steel pipes which will conduct the waters of Stave Lake through the Western Canada's Power Co.'s intake dam.

The Lethbridge City Council, acting on the advice of Smith, Kerry & Chace, their consulting engineers, and the local engineers, Arnold and Reid, gave the contract for the coal and ash conveyors for the new power plant to the Babcock & Wilcox people for $7,775.

T. McAvity & Sons, Ottawa, have just completed an improved style of railway standpipe for the Transcontinental Railway. The stand-pipe possesses several new features which those formerly supplied by this firm to the C.P.R. and I.C.R. did not have. The entire work was done at McAvity's foundry, and it is claimed that this firm is the only one in Canada that makes these fixtures. Four of the stand-pipes have been ordered, one goes to McGivney's Siding, in New Brunswick, and three to points in Ontario.

Building Operations.

The Morral Theatre Co., of St. Louis, Mo., will erect a $40,000 theatre at Saskatoon.

The Farmers' Elevator Co. purpose building an elevator at Carlyle, Sask.

J. E. Edwards & Sons, Toronto, are erecting a three-storey patent leather factory.

A new roundhouse will be built at Lindsay by the G.T.R.

The Alaska Bedding Co. will erect two large factory buildings at a cost of $60,000 at Winnipeg.

Getty & Scott will build a large addition to their shoe factory at Galt. Work will start at once.

The contract for the new High School at Edmonton was awarded to Carmel & Spencer, at $105,101.

The Barrie Carriage Works propose doubling their plant by erecting a new $30,000 building.

The by-law to loan $8,000 towards a mill and elevator has been passed by Nokomis, Sask., ratepayers.

Extensive additions costing $75,000 are planned for the Royal Columbian Hospital, New Westminster.

Snyder Bros., Winnipeg, at $98,269, received the contract for the construction of the new hospital at Regina.

The Toronto Bedding Co. has been granted a permit for a new factory building at that place, to cost $22,000.

The Edmonton Masonic Association will erect a four-storey temple building at an estimated cost of $125,000.

Geo. H. Hees, Son & Co., Toronto, are building a four-storey mill construction addition to their old building.

The McLaughlin Carriage Co.'s new addition to its plant will enable it to turn out 1,500 automobiles per annum.

The contract for building the collegiate institute at Saskatoon has been awarded to the Saskatchewan Building and Construction Co., of Regina, at $84,555.

The Hedley-Shaw Milling Co. will immediately commence work on the building of their new mill at Port Colborne.

The National Elevator Co. is arranging to construct a mammoth independent terminal elevator plant at Fort William.

The Winnipeg Public School Board have been granted a permit for the Salter Street School. The cost is estimated at $72,000.

The Norris Elevator Co., Winnipeg, will build five elevators this year on the line of the Alberta Railroad and Irrigation Co.

The contract for the new Galt Hospital at Lethbridge has been let to J. McDiarmid & Co., of Winnipeg. The building is to cost $60,000.

The Tobin Mfg. Co., a branch of a concern at Norwich, Conn., will build a factory for fire arms and hardware specialties at Woodstock.

The Toronto Ferry Co. will spend at least $500,000 on new buildings at Hanlan's Point this winter to replace the structures recently burned.

Extensions will be made to the Dowsley Spring and Axle Company's plant at Chatham, which was recently taken over by the Gananoque Spring and Axle Co.

The Winnipeg School Board at a special meeting awarded to J. H. Tremblay & Co., St. Boniface, the contract to erect the new Greenway School at a cost of $77,000.

The corporation of Quebec Technical Schools has accepted the plans prepared by R. Lemay, for the construction of their new building to be erected at Quebec City. Estimated cost $250,000.

The Manitoba Provincial Government has decided to give a grant of $250,000 to the Canadian Exposition and Selkirk Centennial, which will include the expenditure on the Provincial buildings.

The C.P.R. Co. have completed plans for the erection of an elevator at Victoria Harbor, Ont. It will have a storage capacity of 12,000,000 bushels, and will probably be the largest elevator in the world.

Clapp & Eatnough, who have been manu facturing tacks and nails in Galt for the last eight months, have organized the Dominion Tack & Nail Co., with a paid-up capital of $40,000, and will build a large new factory.

The Imperial Construction Co., Toronto, has been awarded the contract for the erection of a new Canadian Northern Hotel at Port Arthur. It will cost a quarter of a million.

The contract for the new building to be erected by the Trent Valley Woolen Mill at Campbellford, has been awarded to the Deacon Construction Company of Montreal, and the work will be proceeded with immediately.

A permit has been issued by the Toronto city architect to the Cummings-Lumsden estate to erect a ten-storey and basement office building at the northeast corner of Yonge and Adelaide Street. The building will be constructed of steel and brick and will cost $150,000.

General Manufacturing News.

M. Deysner, representing European capitalists, will build an assaying plant at Cobalt.

The Brodesser Elevator Co., Milwaukee, intends to establish a branch factory in Winnipeg.

The American Horse Shoe Co., Erie, Pa., may locate a Canadian branch at Port Arthur.

The Canadian Malting Co., Winnipeg, will build two concrete storage tanks at a cost of $30,000.

Two more new furnaces have been completed and are in operation at the Granby Smelter, Phoenix, B.C.

The Auto-Dustless Street Sweeper Co., capitalized at $40,000, is a new concern opening a factory in Berlin.

The Detroit-Milford Sanitary Mfg. Co., makers of plumbers' woodwork and sectional bookcases has opened a Canadian factory at Windsor.

A new company, an offshoot of the Sydney, C.B., Cement Co., has been formed at that place to manufacture bricks made from cement slag.

The Regal Automobile Co., Detroit, are looking for a site for a Canadian factory at Sarnia. They purpose turning out 1,000 cars a season.

An agreement has been reached between Aylmer and the Pump and Scales Co. whereby that industry will remain for the next five years at least.

It is reported that St. Thomas, Ont., interests have purchased the Horse Shoe Quarries in connection with a cement industry and propose to manufacture rock cement.

The Asbestos Mfg. Co. has taken over the Canadian Radiator Co.'s buildings at Lachine and will open them as a factory for the manufacture of asbestos, reinforced, corrugated and flat lumber, etc.

Parry Sound ratepayers have passed a by-law to loan $30,000 for twenty years to the Algoma Lumber & Chemical Co., for the purpose of assisting them to build a wood alcohol and charcoal plant.

A re-organiation of the Thermos Bottle Co. has been put through by which the business will be taken over by a syndicate of Ontario men, and the whole plant and offices removed from Montreal to Toronto.

The hot mills of the Sheet Steel Corporation, Morrisburg, have again commenced operation and they will now be run continuously. The new galvanizing machinery, with a capacity of 16 tons per day, is running, and still another galvanizer with a capacity of 8 tons is being installed and will be in operation in a few days. An order for another 16-ton galvanizer has been placed and part of the machinery for the three additional hot mills that are to be installed has been shipped.

The Acadia Coal Co., Stellarton, contemplate making exceptional efforts towards improvements to their collieries. They will build a new bankhead at their Albion Colliery and make other improvements. It is estimated that about $200,000 will be expended, in improvements at the two collieries, the Albion and Allan Shafts, about $100,000 for facilities at each of these mines.

New Companies.

Cochrane Hardware, Ltd., Sudbury; capital, $250,000; to carry on hardware and contracting business. Incorporators, R. McKay, A. Dods and G. Grant, Toronto.

T. Woodbridge & Co., Toronto; capital, $40,000; to manufacture saddlery hardware. Incorporators, Thos. Woodbridge, M. J. Woodbridge and D. Grigg, Toronto.

Rhodes, Curry Co., Amherst, N.S., capital, $3,000,000; to smelt metals, build cars, saw timber, etc. Incorporators, E. Fabre, G. V. Cousens, and F. C. Clarke, Montreal.

J. A. French & Co., Toronto; capital, $40,000; to manufacture soaps, polishes and metal specialties. Incorporators, J. A. French, L. Sievert and W. A. Richardson, Toronto.

The Dominion Electric Co., Ottawa, capital $40,000; to manufacture electrical machinery, devices and specialties. Incorporators, T. A. Low, Robt. Hadley and W. T. Guest, Renfrew.

Armbrust Canadian Brake Shoe Co., Toronto; capital, $100,000; to manufacture and deal in railway supplies. Incorporators, W. C. Nunn, A. A. Dickson, Toronto, and C. W. Armbrust, Chicago.

Standard Supplies, Ltd., Ottawa; capital, $20,000; to manufacture and repair machinery, tools and implements. Incorporators, F. W. Musgrove, E. A. E. Robinson, and W. A. Wyman, Ottawa.

The Solo Saw Co., Ottawa, capital $20,000; to manufacture the Godfrey, Hugh Mossy, Baker saw-feeding device. Incorporators, G. H. M. Baker, Wm. Anderson, and H. I. Thomas, Ottawa.

The Stepney Motor Wheel of Canada, Toronto; capital, $4,750; to manufacture motors, cycles, accessories, tools, etc. Incorporators, W. H. Davies, London, Eng.; Jas. Thomas and G. L. Smith, Toronto.

A. T. Short, Ltd., Cobalt; capital, $40,000; to manufacture machinery and hardware specialties and electrical appliances. Incorporators, A. T. Short, Cobalt; C. H. Andrews, Buffalo; and W. F. Carter, Cobalt.

Canadian Graving-Dock and Shipbuilding Co., Montreal; capital, $2,000,000; to construct and maintain docks, workshops and machinery. Incorporators, M. J. O'Brien, J. A. O'Brien, Renfrew, and F. W. Rons, Montreal.

The Laurentian Chemical Co., Montreal, capital, $590,000; to produce and manufacture wood-alcohol, turpentine, charcoal tar and other products. Incorporators, A. D. Gall, Westmount; R. Prefontaine, and F. E. Lovell, Montreal.

British Tools at Toronto Exhibition.

Crosier, Stephens & Co., 2 Collingwood St., Newcastle-on-Tyne, will have on exhibition at the Toronto National Exhibition specimens of their "Cromil" Polygon Shaping Machines and "Cromil" Polygon Grinding Machines, also a wide range of other handy tools. The exhibit will be in charge of Parke & Leith, Toronto, who are their Canadian agents.

Canada Producer and Gas Engine Co.

The works of the Canada Producer & Gas Engine Co., Barrie, are now ready for manufacturing. A 125 h.p. gas engine is being installed, the small machinery is installed and preparations have been made for the installation of the heavier tools. Patterns are being made and the foundry will start about October 1. The pattern shop is ready for the men to begin work, and in a month it is expected the patterns will be ready. The wood shop, tinsmith shop, tool and stock rooms and offices are upstairs, while the machine department is on the ground floor.

Toronto Machine Works.

The Toronto Machine Works have opened up a manufacturing plant at 64 John St., Toronto. The company consists of Messrs. R. H. Ford and C. B. Dickerson, formerly of St. Catharines, where they manufactured light machinery, and A. M. McGill, formerly a traveler for H. W. Petrie, Toronto. The company intend placing on the market a 20 in. drill, lathe, shaper and emery stand, making a complete equipment for small machine shops for light manufacturing, repair shops, garages, etc. The 20 in. drill is equipped with a positive power feed with four changes of speed or may be used as a hand feed. It has automatic stop, 16 in. table, occupies a floor space 15 x 48 in. and weighs 600 lbs.

New Rubber and Insulating Plant.

The announcement has been made of the incorporation of the Walpole Rubber Co., Ltd., with a capital of $250,000. The factory of the company at Granby, Quebec, is nearing completion; the general sales offices are in the Eastern Township Bank Building in Montreal. The officers and directors of this new company are for the most part officers and directors of the Massachusetts Chemical Co., operating the Walpole Rubber Works, the Walpole Varnish Works, and the Walpole Shoe Supply Works, at Walpole, Mass., U.S.A. The Walpole Rubber Co., Ltd., of Canada, will operate upon similar lines to the parent company, producing all kinds of rubber splicing, insulating and friction tapes and miscellaneous rubber sundries, together with the well-known varnishes and insulating compounds such as armalac, insulac, the celebrated Walpole hot water bottles under the Gleason fusible core process (patented), the cat's paw rubber heels, etc. Granby, beside from being the home of one of the directors, offers many inducements for such an enterprise, furnishing an excellent water power sufficient for all factory purposes and shipping facilities.

Mining by Electricity.

The plans call for the installation of one or two large electrically-driven air compressors and they undertake to supply the mines with compressed air as well as electrical power. The cost per h.p. will be about $50 per annum for a 24 hour service. It is expected that they will be serving their customers about October 31. There will be two intake pipes 8 feet diameter and an outlet pipe of 22 feet. The two inlet pipes will be steel lines. The blow off pipe will be 12 inches in diameter.

This plant is situated six and three-quarter miles south of the Kerr Lake siding of the T. & N.O.R.R. at Ragged Chutes on the Montreal River. They will charge 25c. per 1,000 cu. ft. compressed air at 100 pounds pressure and at a.t. This is on their metered air power contracts. Cobalt should at least get cheap power as there will be two companies in opposition and looking for a market for their power. At present some of the mines are paying $250 per drill per month on an 18-hour service. These two companies will do the same for less than $4 per day, or say $100 per month.

An immense and costly plant is to be erected on the property of the Cobalt Mines Power, Ltd., Cobalt. The various manufacturers of mining machinery in Eastern Canada are now bidding on the supply and installation of the machinery. This plant is an electrical one situate on the Matibitchewan River some 25 miles from Cobalt. The company has the right to raise lakes feeding this power 40 feet. They will have a head of 312 which will be brought to the turbines through two steel tubes 5 feet in diameter. The electrical installtion will consist of four generators 2,500 H.P. each or 10,000 in all. It is proposed to keep one unite in reserve. There will be two transmission lines to Cobalt to prevent any break down, the right of way will be 135 feet. The current will be brought into the camp at 44,000 volts, and the different mines will be fed at a voltage of 2,200.

CATALOGUES.

TRANSFORMERS—Circular 1079 from Canadian Westinghouse, Hamilton, Ont., illustrating and describing fully oil-insulated, water-cooled transformers. Among the illustrations is a view of 2000 kv-a, 50,000-volt transformers at Shawinigan Water & Power Co., Shawinigan Falls, Quebec.

BABBIT METALS — Booklet of babbit metals from Lumen Bearing Co., Toronto, describing their several brands.

BORING MILL—Gisholt Machine Co., Madison, Wis., have issued an addition to their catalogue showing labor-saving attachments in the shape of micrometer index dials and automatic feed trips for their boring mills.

VISES—James Smart Mfg. Co., Brockville, manufacture iron workers' vises and patent steel yoke vises. A catalogue describes the products fully. Pipe vises and saw filers' vises are included in the catalogue.

CONVEYING MACHINERY—Booklet 29, from Beffrey Mfg. Co., Cote and Lagauchetiere Sts., Montreal, describes and illustrates fully methods for handling freight and packages. A post card will bring a copy.

FIREBRICK—The annual 1909 catalogue of Harbison Walker, Pittsburg, Pa., is a handsome volume, pocket size, bound in leather and complete in every dteail. Their lines of firebrick in various sizes are illustrated and listed, showing their applcation to various cupolas and furnaces. Some very useful information is included in the volume, making it a valuable one.

RIVETING MACHINES—A pamphlet from John F. Allen, 370-372 Gerard Ave., New York, tells of the Allen Pneumatic Compression Riveting Machines for structural, bridge and railroad work; boiler, tank and stack construction. These are illustrated and tables of sizes are given.

THREADING TOOLS—The American Tap & Die Co., Greenfield, Mass., have issued their 1909 catalogue, No. 3, of "Adamatine Threading Tools. The line of taps, dies, screw plates, hobs, reamers, etc., is complete, full information being given in regard to taps and dies, such as sizes made, length, number of threads and price. The cover design adopted is effective in setting forth the trade mark and products listed in the catalogue.

Machinery Markets

MONTREAL.

"Great, great!" was the way one dealer answered the question as to how he found last month's business in the machine tool line. "We have done just about double the business as during the same time last year." His sentiments were more or less heartily echoed by the other dealers in machine tools on whom we called. These men did not say this for effect. They meant it. Business is good—and that's about all there is to it.

The trade seems to have shaken off its habit of "fits and starts" which characterized it at the beginning of the year, and the growth of business is steady. Inquiries do not seem to be slackening up and the activity among possible and probable purchasers indicates a very good fall business.

Dealers handling tools made in the United States intimate a probable stiffening of prices, which is not unexpected. Deliveries are lengthening out further and further into the future, which demonstrates the fact that orders are piling up.

Power lines are strong and the larger prime movers are showing increased activity. The J. Eveleigh Co., makers of trunks and bags, are building a new factory, the power plant equipment of which will include two Goldie-McCulloch return tubular boilers, 66 in. x 16 ft. A feature of this instalation is the use of their patented shaving box by which the shavings are automatically fed to the fires. Two 11 in. x 12in. Robb-Armstrong automatic engines, belted to the line shafting will supply the power.

The Montreal L. H. & P. Co. have recently purchased from the Robb Engineering Co. three 350 h.p. Robb-Mumford water tube boilers for the extension to their gas works at Hochelaga. Included in the equipment are two 9 in. x 5 1-2 in. x 10 in. Blake duplex outside packed plunger pumps and a 1,000 h.p. Robb closed feed water heater. The Robb people have also supplied to the St. Paul Electric Co., at Cote St. Paul, a 13 in. x 14 in. Robb-Armstrong horizontal automatic side crank engine and a 72 in. x 18 ft. return tubular boiler. The engine is belted to an 80 k.w. Allis-Chalmers-Bullock generator.

Electrical supplies are receiving much attention and sales are increasing with a steadiness that bids fair to reach a level even higher than ever before. Among the recent orders is one for the equipment of the Harbor Commissioners' new elevator with panel boards and steel cabinets at all the distributing points in the building. The Standard Construction Co. are erecting and the Hill Electric Switch Co. are supplying this equipment.

The activity in leather belting is pronounced, and while there has, as yet, been no advance in prices, it is a foregone conclusion that the higher prices ruling in raw material will force the manufacturers to increase prices to cover themselves as soon as stocks, which were laid in at the lower level, are depleted. With the present activity in this line the advance would seem to be not far distant.

The J. C. McLaren Belting Co. has been reorganized under a Dominion charter, and will henceforth do business under the name

of the J. C. McLaren Belting Company, Limited, with the management unchanged.

There has been practically no change in the price of rubber belting, although throughout the trade the prices have been revised and the higher prices now holding show probabilities of an almost certain advance in the near future. This is but natural as the present prices of crude rubber are the highest in the history of the industry and the present demand is in excess of the visible supply. In connection with this it will be interesting to note the prices of the last 10 years as shown by the following table:

Year.	High	Low	Year.	High	Low
1900	$1.10	92c	1905	$1.36	$1.18
1901	.94	83c	1906	1.29	1.22
1902	.91	70c	1907	1.24	.82
1903	1.10	86c	1908	1.25	.67
1904	1.31	94c	1909	1.70	1.20

The price prevailing at the time of writing (August 21) is between $1.85 and $2.00. Within the past two weeks as high as $2.20 has been asked. It appears that the high water mark has been reached and that the price will come down nearer normal in the near future. Manufacturers are placing orders for "futures" at prices ranging as low as $1.55 and $1.60. The prices on "mechanical" rubber goods in the United States have been recently advanced from 10 to 25 per cent., and that this increase will soon prevail here is almost certain.

The cotton belt market is also up and will likely go higher. There is no indication that this is due to manipulation of the market, but the real solution is, no doubt, the increased demand for fabrics for the manufacture of automobile tires and similar lines. This is not surprising when one views the increase in the automobile industry for the past ten years. In 1898 there were not more than 200 automobiles made in the United States, and, it is safe to say, not one in Canada; the number in use at the beginning of this year is estimated to have been 184,000, with an output for this year of 82,000 cars and arrangements for an output next year of 200,000. The tires for these alone necessitate an enormous use of rubber and cotton duck, and the demand has increased so rapidly that the plantations are having difficulty in keeping step. In fact, at the present time they are lagging behind.

TORONTO.

The metal trade reports good business despite the fact that a number of the prominent metal men are holidaying. Buying is first-class taking into account that this is usually a quiet part of the year. The reviving industrial situation has made a good impression, and the outlook for the fall is more than fair. The 100,000,000 bushel grain crop in the west will help on the good feeling. Indeed, some metal men aver that the coming fall's business will not only be in excess of last year, but also in advance of two years ago.

Iron and steel continue to hold the front rank and trading in them is highly satisfactory. The new United States tariff, while it may not help the Canadian metal trade materially has a tendency to do so. The duty on pig iron has been reduced from $4 to $2.50, and iron ore from 40 cents to 15 cents a ton. Beams, boiler-plate and sheet iron are down 2-10 cent a pound; and about the same reduction has been made on tin-plates and steel ingots. Tubes are cut from 2 to 1 cent, and wire from 45 to 35 per cent.

Railways are buying pretty freely in both Canada and the United States. A particularly pleasing feature being the placing of orders for rails and rolling stock by Canadian roads here in Canada. Structural material, too, is active.

Prospects are that there will be a rise in price in rubber belting ,gaskets, rubber packing, etc. The price of crude rubber has advanced to a point very much beyond that ever reached before. About a year ago fine Para rubber was 80 cents per lb. It has reached $1.92 and $1.95 per lb. in New York. Nearly all the ingredients used in the manufacture of rubber goods has also advanced materially. Preliminary advances have been made by Canadian manufacturers of rubber goods, including belting, packing, etc. Manufacturers generally are compelled to advance the price and unless there is an easing of the market, still further advances will be necessary.

One thing that shows the state of trade is the fact that the Union Petroleum Co., Buffalo, have had to purchase 80 miles of second hand pipe to carry oil from Chatham to Sarnia. This pipe purchased from the National Supply Co., Pittsburg, was made some 20 years ago and was laid in the Fort Wayne field of Ohio two years later. The pipe ranges from three to ten inches, and is in a perfect state of preservation.

Only two companies bid on the order, the National Tube Co., and the Wheeling Iron & Steel Co. Had this bid been put out last year every pipe-making concern in the country would have put in a bid on it. As deliveries had to be commenced during the week, the Buffalo company purchased second-hand iron pipe instead of new steel pipe.

Metal working tools are enjoying a very steady demand. The inquiries are increasing and a larger percentage is being turned into orders than formerly. Wood working tools are selling well and large shipments have been made to British Columbia by some eastern dealers. Foundries are busy, several of the jobbing foundries working to their full capacity.

VANCOUVER.

Development work on Vancouver Island is going on in good shape. Sawmills are being erected, coal mines opened and other work being done at places which were hitherto unknown and business generally is good.

Building is going steadily on, making plenty of work. Those who make a specialty of builders' materials find that department particularly busy.

With the object of saving money, the water committee of the city council has had estimates prepared of the needs of the waterworks system for the next two years, instead of for the next year only. The amount is $370,132, and includes 4,000 new services; 200 new hydrants; 30 miles six-inch mains and laying; 15 miles eight-inch mains; 5 miles 12-inch mains; 2 miles four-inch mains; new valves.

The electrical process of smelting ore has just been inaugurated at the works of the Canada Zinc Company, at Nelson, B.C. The electricity for the furnaces is developed at the Bonnington Falls on the Kootenay River by an English company, and transmitted to the plat at 16,000 volts.

A company has been formed here to take over the business of McDougall & Jenkins, boilermakers, machinists and engineers, of Victoria and Vancouver. The new company, to be known as the McDougall-Jenkins Co., will erect a plant which will be unsurpassed in the Province. Machinery will be installed to enable the plant to handle all kinds of shipping and general engineering work, which is on the increase here just now. The former members of the firm will be retained. The Council of North Vancouver will give the company special consideration in the way of freedom from taxation for a period of years and a supply of water at a nominal rate, realizing the importance of an industry that will employ about 150 hands. The authorized capital is $50,000.

Several Practical Pointers on Commercial Grinding

From the Experience of the Brown & Sharpe Co., Providence, R. I., who have Manufactured Grinding Machines for the Past Forty Years. Grinding is Now an Important Factor in the Production of Machine Tools.

By JOHN J. THACHER

Successful manufacturers realize that one of the factors standing well to the front in achieving their success, is their ability to produce machine parts in duplicate and economically in large quantities. The grinding machine is one of the more modern machine tools, pereminently fitted for producing accurately finished parts in large quantities in a minimum of time.

Fig. 1 illustrates the general type and proportions of what is known as the Universal grinding machine. Work is ordinarily carried on two dead centres and is reciprocated in front of the abrasive wheel by the table, which traverses on ways extending the entire length of the bed. The abrasive wheel and the work are both revolved by power. The work is reciprocated by power or hand, and the feed of the wheel to the work is automatic and is automatically stopped when work is to size.

When using these machines for commercial manufacturing it is well understood by those familiar with actual practice that absolute accuracy is never attained, but there are limits within which pieces produced are perfectly satisfactory and for all practical purposes are duplicates.

For ordinary commercial grinding, a limit of half a thousandth of an inch (.0005-in.) is close enough. A limit of half a thousandth (.0005-in.) means that a piece of work will pass inspection if it is not more than a quarter of a thousandth (.00025-in.) larger or smaller than the specified dimensions. Special cases require special degrees of accuracy, such as some ball bearings, standard plugs, etc., where a limit of one ten-thousandth (.0001-in.) is maintained, while in cases where parts are ground for looks only, no arbitrary limits are established.

The grinding machine not only produces very accurate dimensions on the work ground, but incidentally produces a better finish than any other commercial process, and is the only successful method of finishing hardened steel parts. By good finish we mean that the work shall be perfectly round, calipering the same diameter its entire length; or, in other words, perfectly straight. A good finish means also that the surface shall be very smooth, as is illustrated in the accompanying cut, Fig. 2, at the right-hand half of the piece shown. This finish is superior to the best that a lathe can produce, which is shown in Fig. 3, right-hand half. The actual difference is much more apparent on the pieces from which the cuts were made, but the cuts serve to illustrate the difference between a bearing surface produced on a lathe by an expert mechanic; and on a grinding machine by an operator that is not a mechanic. The greater ease of running and the extended life of a machine when its bearings are ground is apparent to any engineer or mechanic. The grinding process produces more nearly that glazed condition on the steel member of a bearing, which is produced on the cast iron member of a bearing after it has been in use some time—a bearing well known as having remarkable wearing qualities.

Speed is Important.

Quite important in producing the best results in grinding is the speed at which the work is revolved, as it is brought into contact with the abrasive wheel in the grinding machine. This is well illustrated in Fig. 2. The piece of work there shown was ground its entire length in the same machine with the same wheel; the noticeable difference between the finish on the two havles was produced by the relative difference of speed at which the surface of the work was brought into contact with the wheel. The finer finish was produced with a surface speed of the work of about 60 feet per minute, and a surface speed of the wheel of about 8,000 feet per minute. The rougher cut on the left-hand end of Fig. 2 was produced by a very much slower speed of both wheel and work, the work speed being about 10 feet per minute. This, incidendally, shows very plainly that poor results on the grinding machine are not always the fault of the machine itself or the abrasive wheel, and very often wheels not just suited to the particular material to be ground may be made to do very creditable grinding by changing the speed of the work or the wheel, or sometimes both. It also shows that slower speed and diminished output do not necessarily mean better quality of work, on the other hand, that the best work can be produced when running at high efficiency.

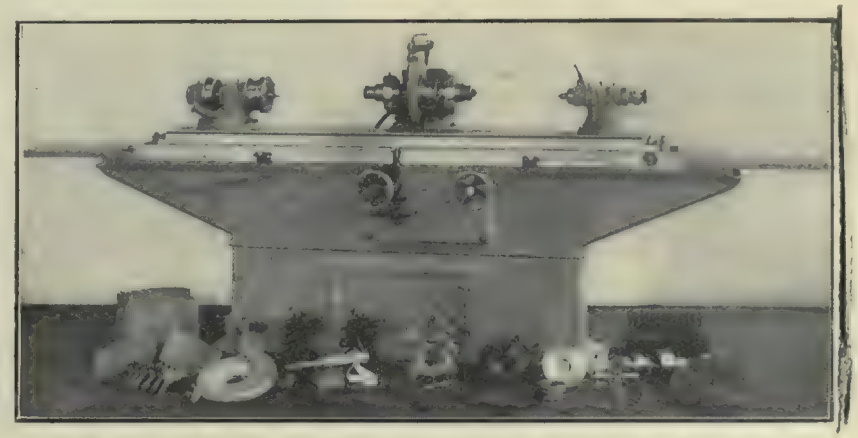


Fig. 1. No. 4 B. & S. Universal Grinding Machine, Showing Attachments.

The piece of work illustrated in Fig. 3 was produced on a lathe and the rough turning on the left-hand end, illustrates what is considered good enough to send to the grinding machine from the lathe; as the grinding machine will remove all grooves at the first traverse of the wheel across the work. Owing to a certain amount of pride, which seems to be general with lathe operators, it is very difficult to get such rough quick turning as this cut shows, but from a commercial point of view, this represents the highest efficiency of both lathe and grinding machine. The introduction of high-speed steel lathe tools brings about the greatest efficiency when work is afterwards brought to size by the grinding process.

Several experiments recently conducted at the works of the Brown & Sharpe

Mfg. Co. tend to prove that it is not generally successful to grind castings or forgings from the rough, especially if accurate results are desired. A grinding machine cannot remove all the scale from a surface in a single cut unless greater pains is taken with centring the work than is consistent with economy. If the scale is removed on one side and left on the other, as is surely the case with ordinary centring, there are unequal strains which will cause the work to spring out of true. It has proven more economical to remove the scale with a lathe, using a cut at least one-sixteenth of an inch deep, then transferring the work to the grinding machine for finishing. When work in large lots is handled in this way the lapse of time between the two operations gives the work a chance to "set," relieving any strains caused by the lathe work, thus ensuring permanency in the ground piece.

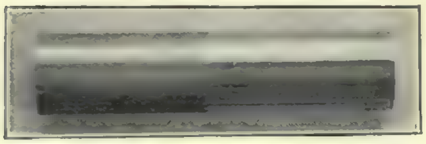


Fig. 2.—Sample of Work.

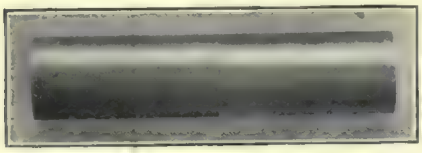


Fig. 3.—Sample of Work.

Work, where accuracy of the ground surface is not of prime importance, may be ground from the rough, and this may be necessary if the work is hardened, but the wear on the abrasive wheel when cutting through the scale is excessive and generally proves very costly.

CANADIAN MANUFACTURERS' ASSOCIATION.

The thirty-eighth annual convention of the C. M. A. was held in Hamilton, Sept. 14, 15 and 16. Robert Hobson, president of the Hamilton Steel & Iron Co., and president of the association, presided at the meetings.

Among the interesting subjects for discussion, were the permanent tariff commission, technical education, insurance, trade and commerce, etc.

Technical Training.

The report on technical education was presented by Mr. C. L. McCullough in the unavoidable absence of Mr. J. F. MacKay, convener of the committee. At the last annual meeting the association had authorized the appointment of a commission on technical education, and an appeal to the Provincial Governments for assistance in carrying the undertaking through.

It was pointed out that Quebec was proceeding with the establishment of technical schools sufficient in number and adequate in equipment for the needs of the Province of Quebec, at an outlay of $3,000,000. The committee interviewed the Governments of Ontario and Nova Scotia, and received encouragement from both sources.

The Federal Goverment intends collecting facts and statistics on technical education for the use of the Provincial Governments.

In view of the association's suggestion that an effort shold be made to have technical education taken up vigorously in all parts of Canada as a purely provincial issue, a summary was included in the report showing what the various provinces have done to date, and their plans for the future. From the west there was practically nothing to report, and very little has been done in Prince Edward Island and New Brunswick. In Quebec there are 11 schools of arts and manufactures, employing 50 teachers, and giving instruction to 2,502 pupils. The subjects taught include drawing, decorative painting, modelling, lithography, joinery, plumbing, shoe paterns, cutting, sewing and music.

It is most gratifying to note that there has been a marked advance in some centres in Ontario towards industrial training of a more definite and practical character, such as metal work, forge shop practice and mechanical drafting. This has been particularly noticeable in Sault Ste. Marie, Woodstock, Stratford, Berlin, Hamilton and Brantford.

The Department of Technical Education has been organized in Nova Scotia for two years. There have been established technical schools in 21 industrial communities. These schools may be divided into four classes—schools for coal miners, schools for stationary engineers, schools for craftsmen and schools for fishermen. The coal mining instruction is the most widespread on account of the great importance of that industry to the province.

Uniform Boiler Law.

A joint meeting of the engine and boiler and engine and thresher sections, was held on Wednesday, Sept 15. William Inglis, Toronto, chairman of the engine and boiler section, presided.

J. W. Harkom reported on the position of the various provinces in regard to a uniform boiler law.

At the present time the laws in the provinces of Manitoba, Alberta, British Columbia, etc., are different, putting a great handicap on manufacturers, and restricting interprovncial trade. It is proposed that uniform regulations for the construction and inspection of boilers. This is only reasonable, and the legislators should see the fairness of the request. Users will then know that if a boiler is built in one province, it will be acceptable in any province.

The following resolution was drawn up and presented to and passed by the C. M. A.:—

"Whereas, the several provinces, under the powers vested in them, have in the past formulated regulations governing the construction and inspection of boilers.

"And whereas, owing to the fact that each province through its staff acting alone, the resulting regulations differed in many respects, causing much confusion, annoyance, and loss to user and builder,

"And whereas, uniform regulations providing for the safety of the public, including users and builders, are highly necessary and desirable,

"Be it resolved, that the Canadian Manufacturers' Association in annual convention assembled does herein urge the different Provincial Governments to accept the principle of uniformity, and to adopt the suggestion offered that a conference of representative officials from the several provinces be held in such place as may be found convenient at the earliest possible date to make recommendations for a uniform measure of this nature."

The following officers were re-elected for the ensuing year: — Chairman, William Inglis; Vice-chairman, J. M. Jenckes; Executive, George W. Watts, R. O. McCulloch and J. J. Main.

New Officers C. M. A.

The following were declared elected officers of the association: — President, John Hendry, the B. C. Mills, Timber & Trading Co., Vancouver; First Vice-Pres. W. H. Rowley, E. B. Eddy Co., Hull; Ontario Vice-Pres., J. P. Murray, Toronto; Quebec Vice-Pres., W. A. Marsh, Que.; B.C. Vice-Pres., W. H. Barker, Vancouver; Man. Vice-Pres., T. R. Deacon, Man. Iron Works, Winnipeg; N. S. Vice-Pres., J. N. Edwards, the Londonderry Iron & MiningCo., Londonderry; N. B. Vice-Pres., James Fleming, St. John; P. E. I. Vice-Pres., Hon. F. L. Haszard, Charrlottetown; Alberta and Saskatchewan Vice-Pres., P. Burns, Calgary, Alta.

Protection of Life and Property, Cutting Factory Costs

Some Devices for the Protection of the Factory, which Saves Dollars of Fire Losses—Schemes fot Reducing Costs in the Machine Department.

Fire insurance can often be materially reduced by the adoption of equipment which will reduce the fire risk. The instalation of a sprinkler system is one scheme for lowering it considerably. In connection with this a fire curtain will almost completely shut off the building from adjacent buildings. This is clearly shown in Fig. 1 where the Gazette Building, Montreal, is cut off from the lumber storage yard adjacent to it.

Fig. 1.—Plant Equipped With a Water Curtain Which Reduces Fire Insurance.

The curtain is illustrated in operation. The pipes extend across the top of the windows. These are supplied with water under pressure by two risers which divide the building in thirds. Each riser supplies half the building with water.

Fireproof Doors.

A scheme that is used by the Frost & Wood Co., Smith's Falls, and which a number of manufacturers use in their plants is a fireproof door as shown in Fig. 2. All openings in the brick walls between departments are closed with automatic fire doors. These are three inches thick covered with sheet iron. The door is hung on a single rail so that if the link is melted the door closes by gravity. Every care should be taken to see that material is not piled against the door.

Clothes and Waste.

In the G. T. R. shops, Stratford, lockers similar to those shown in Fig. 3 are used. Besides adding to the appearance of the shop by not having clothes hanging on every post, there is no chance of fire starting from oily smocks and overalls hanging in the shop over night.

Another method of lowering insurance risk is by taking proper care of oily waste. All oily waste, rubbish and loose material should be deposited in waste tins and removed at night. In the Frost & Wood Company's works these are located in every department in convenient places and cleanliness is insisted upon. The oily waste is carried out and used to start the forges in the smith shop, or for the generation of power under one of the boilers.

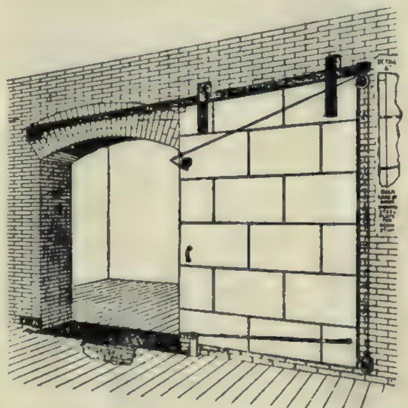


Fig. 2.—Fireproof Door.

Other Savings.

There are some other methods used in a number of shops for reducing costs in addition to insurance. These take a great number of varying forms, all with the same object in view—economy.

A feature in Frost & Wood's shops is the number of trucks used. When work is brought to a machine hand, it is placed conveniently for him. The mechanic puts the finished pieces into another truck and this is removed to make way for another. No time is lost loading trucks as it is as easy to place the machined pieces in a truck as to throw them on the floor.

Automatic Machinery.

An interesting machine in the machine department of the Frost & Wood's shops, is a National Acme automatic screw cutting machine. On this are cut large quantities of screws entering into the make up of binders, mowers, etc. It is worked in connection with a turret lathe and the same man looks after both. Once the proper tools are placed in position on the automatic, the only attention it requires is the feeding of stock. The saving effected by this machine is between \$5 and \$6 per day over old prices.

Grinding Tools Automatically.

In the G. T. R. shops, Stratford, two William Sellers machines are installed for grinding tools. These are similar to that shown in Fig. 4 and have results so tabulated that even an unskilled workman can grind tools for planers, lathes, shapers, boring mills, etc.

Fig. 3.—Lockers for Employes.

By standardizing the shapes of cutting points on all tools in the shop one man may keep all the tools in the shop in good cutting condition. It has been

found to give better satisfaction to have one man take care of all the tools.

Information concerning the proper method for grinding each cutting point is tabulated and mounted in a frame which is held in a convenient bracket. This makes accessible exact directions so that the operator can grind each tool accurately if he follows instructions.

Factory Intercommunication.

In both the G. T. R. shops, Stratford, and the works of the Frost & Wood Co., telephone systems have been installed connecting the various departments and offices.

The nature of the modern machine shop organization with its many departments covering a large ground area, demands that some quick method of communication be installed that will put every department in close touch with any and every other department. It should not be necessary for the foreman of, say, the tool room to go to the foundry to ascertain why certain pattern castings required for a rush order have not reached him. His time is too valuable to be thus wasted. Again, the shipping department, located perhaps in a remote part of the works, should be in as close touch with the superintendent as the departments close to his office.

Notwithstanding the many advantages of the telephone in saving time of men such as foremen and superintendents, there are many plants, otherwise up-to-date, which are sadly deficient in any modern method of factory intercommunication. A considerable saving could be made by the instalation of a telephone system at a comparatively small outlay.

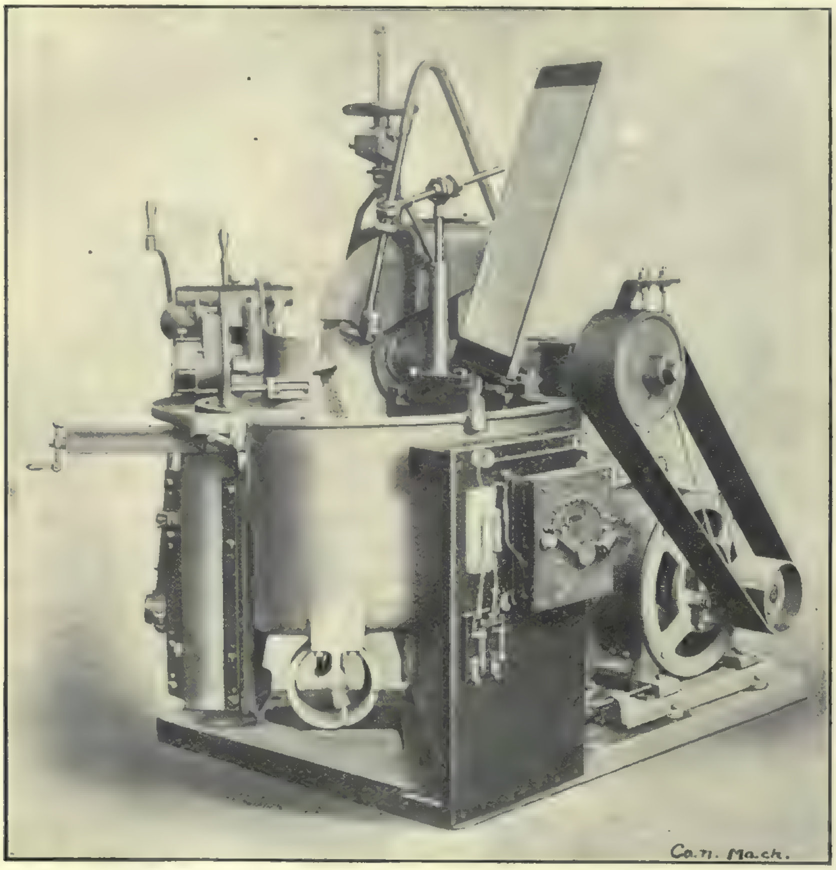


Fig. 4.—A Tool Grinding Machine, With Operations so Tabulated That an Unskilled Man Can Grind Tools For the Shop Accurately.

TESTING FILES AND TOOL STEEL.

Edward G. Herbert read a paper on "The Testing of Files and Tool Steel" at a recent meeting of the Manchester Association of Engineers. The author said that file testing was of considerable importance in workshop economy, as vast differences of efficiency were quite common among the various files on the market. Among the results of the file testing machine, none had aroused more interest than the discovery that the two sides of a file were seldom equal in efficiency or durability. Tests made upon two sides of a file showed that one accomplished three and one-half times as much work and made four times as many strokes as the other before becoming so blunt as to be useless. Extreme variations were now much less frequent than before the first tests were made, and it was clear that with reasonable care it was possible to produce files which were practically equal-sided. The file testing machine had also demonstrated the great differences in efficiency and total output of work which might be caused by minute variations in the shape of file teeth, variations which could scarcely be detected by examination, and which could only be eliminated by extreme care in all the processes of manufacture. In this connection the cut had a far greater influence than the quality of the steel.

The chief factors determining the cutting efficiency of a file were sharpness of teeth, slope of the front face of the teeth, slope of the back face of the teeth, angles at which the two cuts lay relatively to the axis of the file, pitch or coarseness of cut, and ratio between the pitch or number of cuts per inch in the "up cut" and "over cut."

Systematic investigation was now being made in several works as to the best value of any of these seven factors. It had been generally assumed that a good file was good for all classes of work, and a series of experiments was planned to ascertain whether there was one particular cut which was best for all metals. The results went to show that there would be great economy in having files cut specially for the various metals and keeping them to their appropriate work. Speaking generally, files which did well on one particular metal were very inefficient on other metals, and many files sent in by engineers for testing on cast iron and steel were very inefficient on both metals as compared with correctly cut files. It was for the engineer to make the first move, but the difficulty shown to exist might be met to some extent by specialization, and the increase of efficiency would be out of all proportion to the increase of cost. A badly cut file was the most wasteful tool which could be placed in the hands of a workman. A new form of tool-steel testing machine could be pressed into the service of the investigator, as the cutting tool could be made to imitate very closely the action of a single file tooth, and simplify the work of research. Some of the results arrived at with the file testing machine had been confirmed, and it had been shown that the chief factor influencing durability and output of work was the clearance angle or slope of the back of the tooth up to 25 deg. clearance.

The man who is worthy of being a leader of men will never complain of the stupidity of his helpers, of the ingratitude of mankind nor of the inappreciation of the public. These things are all a part of the great game of life, and to meet them and not go down before them in discouragement and defeat is the final proof of power.—Elbert Hubbard.

CANADIAN NATIONAL EXHIBITION, TORONTO The New Transportation Building.

EXHIBITS AT CANADIAN NATIONAL EXHIBITION.

The Canadian National Exhibition, Toronto in point of size and attendance surpassed any previous year. While there were few exhibits of heavy machine tools or machinery, there were some interesting ones showing lines of power machinery. The following are a number of the exhibits :—

Machinery Hall.

R. H. Buchanan, Montreal—Power supplies.

Chapman Double Ball Bearing Co., Toronto—This is a very interesting exhibit, a linen thread driving a countershaft with three pulleys, and a motor wheel is driven from one of these pulleys by friction. In the Transportation Building the application of the bearings to various vehicles is shown.

Canada Metal Co., Toronto—Babbit and metals.

Canada Steam Boiler & Equipment Co., Toronto—Improved Cyclone grates, vacuum valves and Standard Crown valves, manufactured by the Standard Engineering Co., Toronto.

Philip Carey Mfg. Co., Toronto—Pipe insulation materials.

Crescent Oil Co., Hamilton—Lubricating oils.

Dominion Belting Co., Hamilton—Maple Leaf and stitched cotton belting.

Dymond Gas & Engine Co., Toronto—Weber gas engine and Dymond producer.

Ferranti Co., Hollinwood, Eng.—Ferranti meters, represented by George C. Royce, Toronto.

Dodge Mfg. Co., Toronto—Fine display of their well-known pulleys.

Goold, Shapley & Muir, Brantford—Gas engines.

Gilson Mfg. Co., Guelph—Air-cooled cylinder gas engines.

Kellogg & Co., Toronto—Gas engines, drills, etc.

E. Long Mfg. Co., Orillia, Ont.—Water turbines.

Lunkenheimer Co.—Steam fittings of all kinds, including valves, whistles, oil cups, force feeds, etc.

D. K. McLaren, Montreal and Toronto—Oak-tanned leather and waterproof cement.

Smart-Turner Machine Co., Hamilton—Boiler feed pumps and pumps for heating systems.

I. E. Shantz & Co., Berlin and Toronto—Diamond grate bars.

Waterous Engine Works, Brantford—Road roller and boilers.

Dudbridge Iron Works, Stroud, England—An exhibit of oil engines.

Fitz Water Wheel Co., Hanover, Pa., were introducing Fitz water wheels to visitors at the Exhibition.

Garlock Packing Co., Toronto—Garlock packing for steam engines, air compressors, etc.

Jones & Moore Electrical Co., Toronto—Electrical equipment, motors, in all sizes both D.C. and A.C., etc.

Robertson & MacGavin, Toronto—Steam specialties and engineers' supplies.

A. R. Williams Co., Toronto—The largest exhibit of metal working machinery. They exhibited lathes, shapers, etc., in working order. The exhibit fronted the main entrance of Machinery Hall and came in for considerable favorable comment.

G. Walter Green, Peterborough—They displayed saw mills, lath mills, shingle mills, shingle packers, saw jointers, saw gummers, double edgers, wood sawing machines, and a general line of mill machinery.

Brown, Boggs Co., Hamilton—A complete line of presses was exhibited, one having the Jones Patent Safety Device attached.

Parke & Leith, Toronto—All kinds of aluminum cables, etc., the products of the British Aluminum Co., were shown.

"Cromil" Polygon shaping and grinding machines, manufactured by Crosier, Stephens & Co., 2 Collingwood St., Newcastle-on-Tyne, were on exhibit. They also had tin plates, tubes, acetylene lamps, etc.

Murchy Machine & Tool Co., Detroit—The new threading machine with automatic opening die heads was on exhibit.

John H. Hall & Sons, Brantford—A new cold saw was on exhibit in the booth of Kellog & Co., Toronto.

Hammond & Ritchey, Toronto—Agents for Weldarine for welding and brazing castings.

Ambrust Brake Shoe Co., Hanover, Pa.—The exhibit shows engine and car shoes, also electric railway shoes, as well as samples of worn out shoes. The shoes are made with a steel connector cast in the Spacing Lugs, but not in the body of the shoe, and scrap at about four pounds.

Francis Hyde, Montreal—King crucible and rivet furnaces with Jacobs burners, were shown using oil as fuel.

Philips' Pressed Steel Pulley Works, Philadelphia—A full line of pressed steel pulleys was shown at the booth of D. K. McLaren, Montreal and Toronto.

Cowan & Co., Galt—Woodworking and pattern makers machinery.

Canadian Hart Wheels, Hamilton—A full line of emery wheels.

N. J. Holden Co., Toronto—Pneumatic tools, electrical apparatus, railway supplies and air compressors.

Sterling Electric Co., Toronto—Electrical supplies, including tungsten lamps, etc.

Industrial Building.

Butterworth Foundry Co., Ottawa—In addition to other products of their works, such as stoves, etc., they exhibited Fleming grate bars.

Electrical Specialties, Ltd., Toronto—Batteries in all sizes and electrical supplies.

J. A. & W. Bird & Co., Boston—Cotton belting, represented by T. R. Flint, Toronto.

S. F. Bowser & Co., Toronto—Oil storage tanks.

Canadian Westinghouse Co., Hamilton—Small motors, Nernst lamps and electrical fixtures.

James Morrison Brass Mfg. Co., Toronto—An attractive exhibit of brass goods, such as steam specialties, brass fixtures, steam gauges, electric light fixtures, etc.

H. W. Johns Manville Canadian Co., Toronto—A fine display of all kinds of insulating materials for steam pipes, packings, etc.

Northern Electric & Mfg. Co., Montreal and Toronto—Motors, electrical fixtures, factory telephones for interfactory communication, etc.

Tallman Brass & Metal Co., Hamilton—Metals and babbits, including Arctic metal.

Canadian Sheet Steel Corporation, Morrisburg—This company's exhibit of sheet steel and tin plate along with a series of photographs showed the products of their works and the facility they have for turning out the work.

The Carborundum Co., Niagara Falls—The exhibit of grinding wheels and grinding materials was very complete and received much attention from interested visitors to the Exhibition.

B. Greening Wire Co., Hamilton—All kinds of wire screening were shown, together with wire cable.

Northern Aluminum Co., Toronto—Aluminum materials, including cables.

Rice Lewis & Son, Toronto—In addition to several lines of hardware specialties, mechanics' tools, etc., were displayed.

Manufacturers' Building.

Canada Rubber Co., Montreal—Mechanical rubber goods, etc.

Dunlop Tire & Rubber Goods Co., Toronto—Mechanical rubber goods, etc.

Gutta Percha & Rubber Mfg. Co., Toronto—Mechanical rubber goods, etc.

(To be added to.)

Implement Building.

W. D. Beath & Sons—Transmission supplies, expanded metal, etc.

Metal Shingle & Siding Co., Preston—Metal roofing for factories.

BOOK REVIEWS.

ENGINE LATHE WORK—By Fred H. Colvin, published by the McGraw-Hill Book Co., New York, 180 pages, 4½ x 7 ins., illustrated. Price $1.00, postpaid.

This is a book of practical suggestions which will give the young machinist or apprentice the foundation principles of engine lathe work. Every good machinist becomes acquainted with these rules and applies them as a matter of course. This book will give the younger apprentices a chance to become acquainted with the foundation principles.

There are fourteen chapters dealing with different phases of lathe work. Chapter 1 deals with the engine lathe and carriage ; 2, centering lathe work ; 3, driving the work ; 4, tools and turning ; 6, face plate work ; 9, taper turning ; 10, thread cutting ; 11, test indicators and their use ; etc. The headings of these chapters will serve to show the thoroughness with which the subject is treated. All points in connection with lathe work are carefully illustrated making the treatise very complete.

MACHINE SHOP DRAWINGS—By Fred H. Colvin, A.S.M.E., F.I. Published by the McGraw Hill Book Co., New York, 139 pages 4½ x 7 ins., illustrated.

One of the weak points in many apprenticeship systems is teaching the apprentice to read drawings, make machine shop sketches and lay out work. This book by Mr. Colvin, takes up the subject in a comprehensive manner and will be a great help to the mechanic or apprentice who studies it. The book gets away from those books for mechanics, which teach them to draw and fills a long-felt want by teaching them to read drawings. It shows how seen and unseen portions are represented, and how to secure a correct idea of the shape of the piece represented.

Attention is also given to laying out work. Chapters 4, 5, 6 and 7 are devoted to this, 5 treating of spur gears, 6 of bevel gears and 7 the worm and worm wheel. Chapter 8 is devoted to sketches. It is most important that a mechanic be able to sketch, especially those of an inventive turn of mind. The whole idea is to give an idea of how to read drawings and it is done very thoroughly.

WOULDN'T MISS AN ISSUE.

Editor Canadian Machinery.

I regret very much having overlooked my subscription to Canadian Machinery so long, and I thank you for still sending it as I do not want to miss one issue. I look forward to its monthly visits with a good deal of pleasure, and enclose $1, which you will please place to my credit. Wishing you continued success.

W. DALGHEISH.

Employees' Benefit Societies in Manufacturing Plants

First Aid to Injured at John Bertram & Sons Co., Dundas—Employees' Benefit Societies at Waterous Engine Works, Brantford, McClary Manufacturing Co., London, John Bertram & Sons Co., Dundas, and Goldie & McCulloch, Galt.

In a number of industries, associations have been established for the benefit of the men and they have been found of inestimable benefit to the men. A reflex action has also been felt by the companies. In those societies selected for description, it has been found that in addition to the benefits the men obtain, the men are more contented. Both employer and employes will find it to their advantage to establish benefit associations.

The growth of industry has greatly increased the risk of injury on account of the application of electricity in many lines of industry, unprotected machinery, the rush of competition, etc. The establishment of Benefit Societies, subscribed to by the men themselves and aided by the manufacturers in whose works they are established will be found to be an excellent system from an economic standpoint.

The following systems employed by several large Canadian manufacturers, are found to interest and benefit the men and to be of great value to companies in whose works they are established.

First Aid to Injured at John Bertram's.

A branch of the St. John's Ambulance Association has been established in the works of John Bertram & Sons Co., the principal aim being to render first aid to the injured. The class was organized in September, 1907, several men taking the course prescribed by the St. John's Ambulance Association, Dr. Langhand being secured to deliver the lectures.

Some of the things taken up in the course of lectures were, fractures, sprains, electric shock, burns and scalds, etc. Examinations were held and the papers were sent to London, Eng., to obtain certificates from the St. John's Ambulance Association.

The books of instruction and the kits came from London, Eng. The latter were supplied by the John Bertram & Sons Co. The kits are placed in convenient positions in the various departments and are in charge of the graduates. The kits contain needles, pins, bandages, splints, batting, plasters, liniments, etc. The foundry kit has balm for burns, carron oil, etc. Supplies are kept by the storeskeeper who give them out to the graduates.

In the office a large special kit is kept for the use of the doctor when he is summoned. Stretchers are also in readiness in the office and foundry.

Waterous Engine Works, Brantford.

The Waterous Engine Works Co. Factory Employes' Mutual Sick Benefit Society was inaugurated about twenty years ago.

Its management is exclusively in the hands of the employes of the factory. The company acts as its treasurer and Walter T. Mair serves in the capacity of secretary. The result of this arrangement is that the employes are relieved of any accounting and the real handling of the funds. The company subscribes to the society annually a fixed sum and there are assessments levied upon the employes at such intervals as may be necessary, although under the by-laws, an assessment can be levied twice each month. This year up to the present it has only been necessary to levy nine assessments. These assessments are of three amounts viz. 10c, 15c and 20c based upon the rate of wages in each class. The benefits paid are also in three classes, viz., $2, $3 and $4 per week of six days. The maximum benefit to be paid in each year is for twelve weeks. There is also a funeral benefit of $30.

Membership in the society is compulsory, in so far as the moment a man enters the employ of the company he becomes a contributor to the benefit funds.

The assessments collected are paid in to the credit of the society and are withdrawn in a very simple manner. The foreman reports to the visiting officer that a man in his department is absent through illness, giving the date of such absence. The visiting officer then investigates the matter and reports to the directors of the department affected that he has visited the person named and that he is entitled

THE WATEROUS ENGINE WORKS COMPANY FACTORY EMPLOYEES
MUTUAL SICK BENEFIT SOCIETY

ALL BLANKS IN THIS NOTICE MUST BE PROPERLY FILLED OUT BY FOREMAN ISSUING

NOTICE TO VISITING OFFICER. No............

Mr.................... (Check No.................) of No........................

Street, in.................................Department, has reported himself sick and has been absent from work since..................................

....
Foreman

VISITING OFFICER'S REPORT

I certify that I have visited the person named above, and find that he is unable to work. and is entitled to receive Sick Benefits from..............................190 (inclusive).

Nature of Illness.................... ....
Visiting Officer.

ORDER TO SECRETARY.

The Secretary is hereby authorized to issue an order in favor of the person named above for Benefits from date mentioned in above report at the rate to which he is entitled.

....

....
Rate c. per day Directors

ORDER ON TREASURER FOR PAYMENT. No..........

$............ Brantford,

To W. E. W. Co., Treasurer of
THE WATEROUS ENGINE WORKS COMPANY FACTORY EMPLOYEES
SICK BENEFIT SOCIETY

Please pay.. (Check No..............)
(the person named in the Certificate on front hereof) the sum of
...........................Dollars, for........................day's benefit,
ending..................................190

Secretary. President.

RECEIPT FROM BENEFICIARY FOR AMOUNT PAID.

Received from the Waterous Engine Works Co. Factory Employees Sick Benefit Society the sum of...............................Dollars in full for Sick Benefits (agreeable with the certificate on the front hereof) up to...................................190

....

Brantford..............................190

Both Sides of Forms Used by the Mutual Benefit Society in the Waterous Engine Works, Brantford.

to receive sick benefits from a certain date. An order on the secretary is then signed by the two directors to pay the benefits and an order is then made by the secretary upon the company for payment of the amount. A cheque is issued to cover all the benefits to be paid and the currency is handed to the visiting officer for distribution among the beneficiaries and a receipt is taken for the amount so paid. For convenience this whole performance is confined to a single sheet.

As the funds of the Sick Benefit Association can only be used for the purpose of paying sick benefits, it was decided a few years ago to inaugurate another fund, which is used for the purpose of relieving special cases of distress among the members of the society. This fund is at the disposal of a special committee of five who can disburse it through the same medium as the regular funds are disbursed. This has eliminated entirely the necessity of taking up subscriptions among the men or the passing of the hat for monies to relieve distress.

The operations of the society have been very successful. All the members seem to be perfectly satisfied with the way it is cooducted and the benefits are paid very promptly after the 1st and 15th of each month. The policy, in paying the benefits has rather been liberal than otherwise. No medical certificate is asked for except in cases where fraud is suspected and these are a very rare occurrence. The beneficiary in every instance is given the benefit of a doubt.

McClary Mfg. Co., London.

The McClary Mfg. Co. Employes' Benefit Society was founded in 1882. The membership is optional, but about ninety-five per cent. of the employes are members. In case of illness, or accident, they are allowed $3 per week for ten weeks, and half benefits for a further ten weeks, for which they contribute to the society, ten cents a week. In the case of boys and girls making less than $6 a week, they pay in half this amount, and receive half benefits. Twenty-five dollars is paid in case of death.

Two doctors are elected annually, and paid out of the funds of the society.

There is also a special fund set aside for extraordinary cases, and out of this, special contributions are made in case of urgent necessity. This is known as the "Concert Fund" and its revenue is derived from entertainments. The expenses of an annual picnic are also drawn from this source.

A new department is being established in connection with it, known as the "Welfare Department," and a trained nurse will be employed to visit those who are seriously ill, supervise and recommend sanitary arrangements, provide recreation for the girls, attend and assist at the dining rooms, (of which we have separate ones for the men and girls), give instructions in "First Aids," and also cooking classes in the winter evenings.

The income already stated is sufficient to pay running expenses and accumulate a healthy reserve, which is placed to the credit of the society in the bank in case of any possible epidemic, such as occurred a few years ago when la grippe was so prevalent.

Mutual Benefit Society at John Bertram & Sons' Co.

The Mutual Benefit Society in the works of the John Bertram & Sons Co., was organized in 1904. Its aim was to establish a fund for the relief of sick members. The membership is open to all persons in the employ of the company and very few have not joined the association. Benefits are paid with the least possible restrictions, all that is required from applicant is a certificate from some registered physician and the report of a sick visiting committee that the sickness or accident is not occasioned by immoral conduct or the use of strong drink.

Members of the association quarantined on account of infectious diseases receive the same benefits as if sick.

No initiation fee is charged, but each member is assessed 40 cents per month and receives $4.00 per week in case of sickness or accident, and this may be continued for 13 weeks in any one year if necessary, and even then the executive committee may grant special relief if deemed advisable.

The affairs of the association are governed by a Board of Management, consisting of a president, vice-president, secretary, treasurer and fifteen representatives representing all departments of the works. These officers and representatives are elected by ballot at the annual meeting of the members in whose hands is the entire control of the association.

The actual running expenses of the association including salaries, printed matter, supplies, expenses of annual meetings, etc., up to April 30th, 1909, amount to only $164.85, an average of $32.97 per year; this does not include the salaries of officers for last year as these items did not pass the committee till after the close of the year.

Date ...... 190 $ ......

Name ......

For ...... days Benefits ending 190

No. ......

Order on Treasurer For Payment.

$ ...... Dundas, Ont., ... 190

To the Treasurer of

The Employes' Mutual Benefit Association of the John Bertram & Sons Co

Please pay ...... (the person named in the certificate) the sum of ...... Dollars for ...... days benefit, ending 190

Secretary President

Receipt From Beneficiary

Received from the Employes Mutual Benefit Association the sum of ...... Dollars in full for Sick Benefits (agreeable with the certificate on the front hereof) up to 190

Dundas ...... 190 ......

THE EMPLOYES' MUTUAL BENEFIT ASSOCIATION OF THE JOHN BERTRAM & SONS CO., LIMITED

Notice To Visiting Officers No......

Mr. ...... (Check No ......) Sec ...... Residing on ...... Street, has reported himself sick and has been absent from work since ......

Secretary

Visiting Officers' Report.

We certify that we have visited the above named person and find he is unable to work and is entitled to receive sick benefits from ...... 190 (inclusive)

Visiting Officers

Medical Officer's Certificate.

This to certify that Mr. ...... is under my care, and is unable to follow his usual or other employment. ...... M. D

Nature of illness ......

Both Sides of Form Used by the Mutual Benefit Society, John Bertram & Sons Co., Dundas.

Three hundred dollars is the maximum the association can carry, for when that is reached the assessments cease on all members who have been in the association six months or over until the amount drops to $200.00, when all assessments are resumed, thus preventing the accumulation of a large fund, yet keeping a sufficient amount in the treasury to meet all requirements.

The officers of the present year are:

President—Alex Bertram, superintendent.

Vice-President—D. M. Finlayson.

Secretary — J. A. Thompson, cost keeper.

Treasurer—S. Briggs.

The association is independent of the company, being controlled by the employes. Every possible assistance is given by the company. One way it has assisted is in the matter of collections. Mr. Henry Bertram offered to have the time clerk deduct the assessments from the envelopes and this proposition was accepted by the men. By this method, collections are kept up-to-date and the members do not feel the assessment.

A member must be in good standing in the association for six months to secure benefits. This association have found it advisable in a small town not to employ a doctor, but rather to let each beneficiary employ his own doctor and pay the higher benefits necessary under such conditions.

The secretary and treasurer are both on bond, the cost of the bond being paid by the association.

This association has been successful and there are at least three reasons for its success,—1. It is an employes' society controlled by them ; 2. It has the hearty co-operation of the company ; 3. It is well managed.

Last year the society successfully financed an enjoyable and elevating entertainment at which the ladies were present. This is to be made an annual event. For one assessment a member was given a ticket for himself and lady. The cost for the best talent, orchestra, lunch, etc., was about $70. The object was to give the employes something edifying and from this point as well as financially, it was a success. There was enough funds left to turn into the association, after the outing, to make another assessment for benefits unnecessary that month.

Forms are reproduced showing the necessary steps in securing the benefit. There is doctor's report, visiting officers' report, etc. The report properly signed is sent to the treasurer, who makes out the cheque and secures the receipt for filing.

Goldie & McCulloch, Galt.

The Dumfries Foundry Benefit Society of the Goldie & McCulloch Co., Limited, Galt, has been in existence for the past twenty-five years, having been first organized in the year 1883. The success and popularity of this society has gradually increased until at the present time the society is one of the most successful Employes' Benefit Societies in Canada. The membership averages 300. During the twenty-five years that this society has been in existence they have paid out :—

For sick and funeral benefits	$15,002.27
For medical attendance	2,731.25
For dividends	10,165.30
For general expenses	1,557.00
Making a total paid out of..	$29,456.19

The management of this society is vested in a president, secretary and treasurer, with an executive committee of eight, one from each department of the works. At the end of each year the monies in the treasury is proportionately divided among the members according to the period of membership, the sum of fifty dollars only being retained as a society fund.

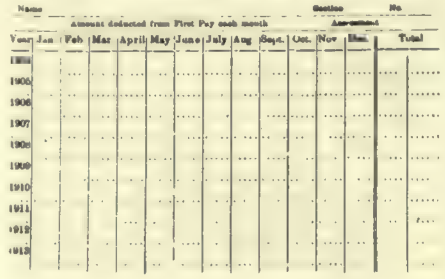
Every person who is an employe of the company is considered eligible to become a member, irrespective of age or sex so long as they are in good health and of strictly moral character.

Every member on admission must pay the entrance fee of twenty-five cents and the regular monthly dues of thirty-five cents. Forty cents paid at the beginning of each year or within one month after joining will provide free medicine for the year.

Each member unable to follow his trade or any employment by sickness or accident, providing he has notified the secretary through the committee men, receives a daily allowance of fifty cents for the first thirteen weeks, thirty-three cents for the next thirteen weeks, and twenty-five cents for the next twenty-six weeks. A funeral benefit of twenty-five dollars is also paid at death to help defray funeral expenses.

The shop doctor is always at the service of sick or injured members without charge.

The society hold annually, a most successful excursion, and in addition to


EMPLOYEES' BENEFIT ASS'N

Name Section No.

Amount deducted from First Pay each month

Year	Jan	Feb	Mar	April	May	June	July	Aug	Sept.	Oct.	Nov	[illegible]	Total
[illegible]													
1905													
1906													
1907													
1908													
1909													
1910													
1911													
1912													
1913													

Card for Tabulating Assessments

this, an annual picnic. These two occasions result in considerable revenue for the society's funds.

The firm is very liberal in their donations to the society and care of its members. They donate each year one hundred dollars towards the funds and also one hundred dollars towards the annual picnic.

Twelve medical cabinets which are placed in the different departments equipped with stretchers, splints and all necessary appliances and medicines necessary in the keeping up of these cabinets for accidents and sickness, are also supplied by the firm on the condition that a committee of two members of the society be appointed to look after and keep in condition each cabinet.

The average sick membership annually is about 40 and the average annual payment of benefits runs 1,000 to 1,200 days.

The dividend which is declared at the end of each year amounts in some years to almost the total amount paid in. This of course depends greatly on the amount of sickness and the number of deaths during the year.

THE HARE ASH AND COAL HOIST.

With the expansion of the traffic of the railways throughout the country, it is becoming increasingly necessary to provide at the various terminal points, more rapid and economical methods for removing the ashes from the incoming engines.

For many years during the early development of the country the usual equipment for this purpose consisted in a long deep pit excavated between the rails of the "incoming" track, and over which the engines would pass on their way into the roundhouse. This pit, while being extremely simple and cheap to construct, is open to many serious objections, especially at terminal points where a large number of engines must be taken care of. In the operation, the engine would be placed over the pit, and a man underneath would rake out the ashes from the ash pan, allowing them to fall in the pit. When the engine has moved off the ashes are shoveled out of the pit onto the level ground, by hand, and from there into an ash car, which would be standing near on a parallel track. With this arrangement it is impossible to handle many engines, as unless the pit is very long the following engine must wait until the pit has been cleaned or else it must dump its ashes on top of that from the first engine. This soon fills up the pit, and makes it absolutely necessary to clean out before handling another engine. If the ashes are thrown out after each engine, the operation of the pit is very slow and causes delays. Again, the ashes when thrown out of the pit and piled at the side of the track must be wetted down to prevent the dust blowing over the engines in winter. If not removed at once, the ashes soon freeze, making it very costly to clean up.

Improvements to this style of pit have been made in various ways, such as placing the ash track which parallels the incoming track on a lower level so that the height to which the ashes must be thrown is reduced, but this, while making it easier for the laborer, and therefore somewhat cheaper, introduces the element of different grades in the same yard, which is objectionable. Sometimes one side of the pit is excavated, and one rail of the incoming track carried on a light girder and the ashes when dumped into the pit are pulled out at the side. This feature allows one engine to follow another as it permits the cleaning of the pit, while an engine is discharging. At the same

time this is only partly true, and if engines follow one another quickly the side pit soon fills up, or else the pit must be very long, and well manned. This calls for a corresponding number of ash cars standing alongside the pit, while water pipes must be laid throughout the whole length, so as to command the entire pit, which are always liable to interruption from freezing, etc. Breaks and leaks are not uncommon, and this means that the pit is soon flooded and frozen up.

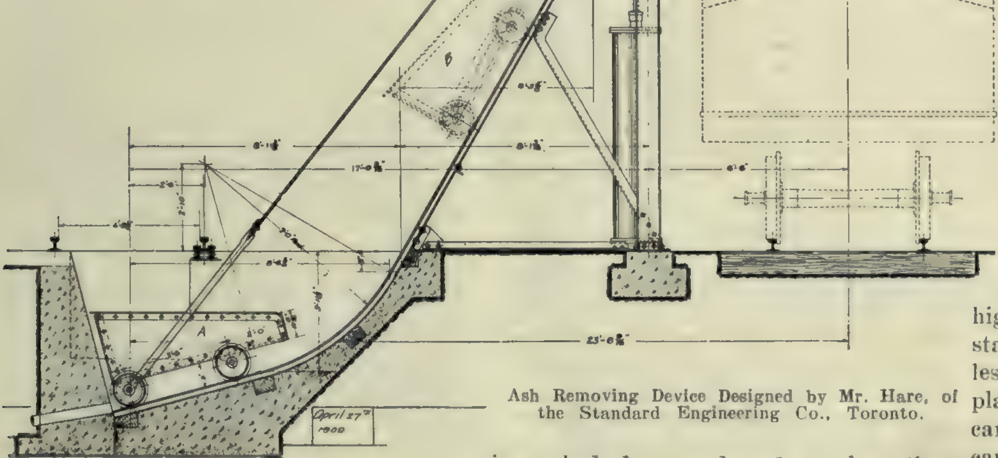
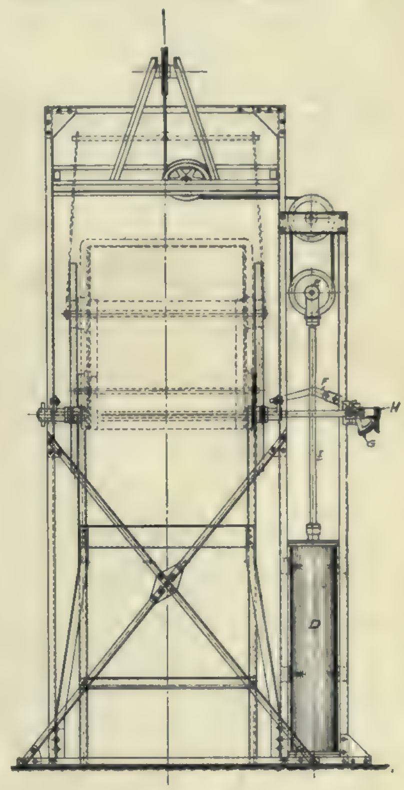
This type of ash pit can clean an engine for 35.7 cents, when handling in the neighborhood of 60 engines per day.

*The cost divided as follows:—

	cents.
Fixed charges	4.8
Labor	26.1
Power, supplies, etc.,	1.2
Pro rata charge	4.8
Total	36.9

A type of hoist which for rapidity and low cost of operation is considered a decided advance on these former types is shown in the accompanying illustration.

This type of ash hoist is known as the inclined rail type, and consists principally of a steel hoist tower, supporting the inclined rails, which extend into the track pit under the incoming track. On these inclined runs a skip car, built substantially of steel plates and fitted at the back with a perforated panel to allow for drainage of water. An air cylinder capable of lifting the fully loaded skip car with a moderate air pressure, is connected to the skip car by a steel cable through suitable sheaves, and a steel bail pivoted on the back axle of the skip car.

Ash Removing Device Designed by Mr. Hare, of the Standard Engineering Co., Toronto.

The distinctive feature of the hoist is shown in the way the skip car is carried over the top of the ash car when in the dumping position "C." The inclined rails are in line with two extension rails, which are keyed to the steel cross shaft shown. This shaft is operated through the segmental gears "G" and "H" from the lever "F," which in turn is actuated by the projecting end of the pin on which the sheaves "E" revolve.

When the skip car is filled, with ashes, the air is turned on the cylinder, depressing the piston and rod "I." When the sheaves "E" in their downward movement reach the lever "F," the lever is pushed downward and revolves the shaft and gear "G" and gear "H," which revolves the cross shaft, thus lowering the extension rails "K" to the horizontal position "J," thus allowing the front wheels of the skip car to roll outward carrying the lip of the car over the top of the ash car, and allowing the contents to be dumped in the centre of the ash car.

When the ashes have been discharged, the air in the cylinder is released allowing the skip car to fall back on the incline and so downward to the position "A" in the track pit. Where the piston "I" in moving upward passes the lever "F" the counterweight shown on the cross shaft falls, and in doing so revolves the cross shaft and raises the extension rails again to the position "K."

It should be noticed that this movement of the cross shaft takes place every time the skip car is raised or falls on the incline, and consequently the extension rails are never projecting over the ash car, except when they are required to be in that position to support the skip car, and that they are at all times positively operated, coincedent with the motion of the skip car on the incline.

This arrangement is a decided improvement over hoists in which the incline rails extend across the ash track, and thus prevents the passage of any high rolling stock on that line. Instances are not wanting where a careless crew when shunting at night would place a box car on the ash track, and carry away the entire structure. This cannot possibly happen with this hoist.

The capacity of this hoist can be made to suit any particular specifications, but will easily carry 1,800 pounds of ashes at a time. By the novel design of the skip car, it is possible to use an incline at the angle of 60 degrees from the horizontal, while the top of the car is only 45 degrees, or within the angle of rest of damp ashes.

The operation of this hoist is rapid, and the total cost of removing ashes from engine to ash car in a moderate sized terminal will not exceed 15 cents per engine, which is less than half the cost for the open-sided hand-operated pit.

This design of hoist is particularly

* C. F. Whitton, "Handling of Locomotive Ashes."—Trans. Can. Soc. C.E.

adapable to the coaling of locomotives as there is nothing to prevent an engine passing in front of the hoist, and at the same time the skip car is projected forward in dumping, thus placing the coal in the centre of the tender hopper without undue breakage. In this case bins are constructed over the receiving end with drop bottom transfer cars running underneath, which in turn dump into the skip car, the whole forming a most rapid and effective coaling station at moderate outlay.

The Hare Ash and Coal Hoist is the ininvention of Mr. W. Almon Hare, manager of the Standard Engineering Co., Ltd., Toronto, for whom patents have been applied in Canada and principal foreign countries.

CHEAP ATTACHMENT FOR THE UNIVERSAL MILLER.

By Philip G. Hall.

This attachment was made primarily for nicking the teeth of some large milling cutters, and was fitted on a Brown and Sharpe universal milling machine (No. 2 size). It may be very well used for other jobs, such as rack-cutting, etc. Figs. 1 and 2 will make the arrangement fairly clear. A is a grey iron casting, bored out at the top a sliding fit on the overhanging arm of the miller B; the lug is afterwards split, and holes drilled for locking bolts as shown. The bottom part of the casting is bored at right angles for a steel bush, the latter being kept from rotating by a sunk key. The lug C and bush are then split and a set-screw fitted so that the bearing may be adjusted as the bush wears. A pair of bronze bevel wheels (not necessarily machine-cut) are bored and turned, the one fitting a short mandrel placed in the machine spindle, and the other the bracket A, the latter being screwed out a left-hand thread (14 per inch) to carry the short cutter mandrel, and fitted with an adjusting nut D, kept in place by a "grub" screw.

In using this attachment the bracket A is so placed on the overhanging arm that it brings the two bevel wheels into gear. It is then securly locked by the two bolts in the top lug.

It may be of interest to some readers to know why this attachment was made. Usually, roughing cutters for "slab" millers (as the one shown in the sketches) have a coarse pitch thread cut on the blanks, before the teeth are milled out, the obvious reason being to break up the chips, and so relieve the machine of a considerable amount of strain. A glance at Figs. 3 and 4 will show why this thread is not nearly so efficient as the "nicks" cut out with the above attachment on the miller.

Suppose the feed of cutter is 5-16 in. per revolution; this means (as there are 20 teeth in the cutter) 1-64 in. for each tooth; and referring to H, Fig. 3, we see the appearance of the job after one tooth has passed over it, the projections being left by the "nicks" in tooth face. Now, taking an individual tooth of the cutter, its motion is very similar to that of a planning tool, the only difference being that it has a circular instead of a straight line motion; if, therefore, the "nicks" are cut on a lathe (in the form of a thread), it is evident that one side will have an excessive, and the other a minus, clearance (see Fig. 4), so that as the tooth passes over the work, it will have to shear off a portion of the projection shown in Fig. 3, causing unnecessary friction, and tending to dull the corner which has no clearance. With a straight "nick" (as made by the attachment), Fig. 1, this is entirely absent, and the cutter will therefore keep cooler and last longer without regrinding. It might here be pointed out that the "nicks" may be placed on the cutter blank to form any spiral (or pitch) required, that shown in Fig. 1 corresponding to an 11 in. pitch thread with ten starts. The method of obtaining this is simple. The teeth are first milled out in the blank as desired, then the attachment is put into position, and the "nicking cutter" brought to the end of the blank. The leading screw of the machine is now given four turns (it being of ¼ in. pitch), and the knee raised to stop, thus cutting a "nick" 1 in. from the end of the mill. After lowering the table, the screw is given four more turns, and the second "nick" cut, this being repeated until the tooth is finished. As the table is advanced the cutter blank is rotated by the gears (used for the spiral flutes) acting through the dividing head, thus keeping the relative positions of the tooth and nicking cutter the same. In nicking the second tooth, the dividing head is turned through 1-20th of a revolution (it being indexed for 20 teeth), and the leading screw given two turns for the first "nick" and four for the rest, thus generating the 11 inch pitch spiral required.—Mechanical world.

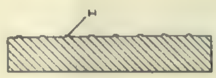
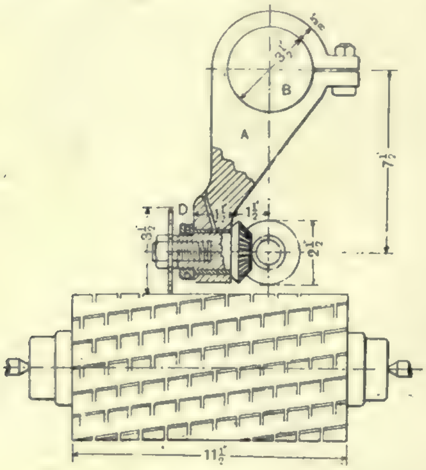


Fig. 3.

Fig. 4.



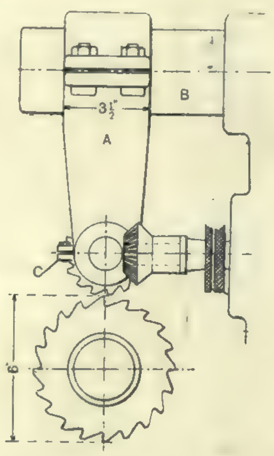


Fig. 1.—Cheap Attachment for Universal Miller.—Fig. 2.

CENTRAL RAILWAY AND ENGINEERING CLUB.

The regular monthly meeting of the Central Railway and Engineering Club, Toronto, was held in the Prince George Hotel, on Tuesday, Sept. 21. A paper was read on "Care and Washing out of Locomotive Boilers," by J. V. Jackson, Boiler Inspector, G.T.R., Montreal. The paper showed the difficulties to be overcome and gave the easiest and quickest way to clean locomotive boilers. Mr. Jackson pointed out that boiler scale not only greatly increased the fuel bill, but when the scale was heavy became a source of danger. He recommended frequent cleaning of boilers.

The discussion brought out a number of excellent points in regard to the removal of scale, compounds, etc. It was pointed out that soda in some form was the best scale loosening compound. President C. A. Jeffries, master mechanic, Consumers' Gas Co., occupied the chair.

The next meeting is on Tuesday, Oct. 19, when Mr. Shales of the Elevator Specialty Co., Toronto, will read a paper on "Care and Maintenance of Elevators."

C. H. Temple, formerly master mechanic of the central division, C.P.R., has been appointed assistant superintendent of motive power, with office at Winnipeg.

MACHINE SHOP METHODS AND DEVICES

Unique Ways of Doing Things in the Machine Shop. Readers' Opinions Concerning Shop Practice. Data for Machinists. Contributions paid for.

EVERLASTING LUBRICATION.

By E. Crabtree.

The necessity of proper lubrication for high-speed machinery is acknowledged by all machine builders and users, and although various devices have been applied in the shape of automatic oilers,

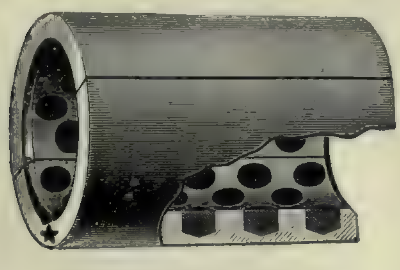


Fig. 1.—Lubricating a Bearing.

grease cups and ring oiling bearings, these have all got their drawbacks inas-much as should a careless apprentice fail to keep these devices filled with lubricating product, the machine is left to take care of itself and a lack of lubrication is not realized until bearings become heated or the machine refuses to run.

A very successful and most economic way of overcoming any defects such as the above has been in the bearings themselves being so constructed as to produce enough lubrication to last out the life of the bearing itself without even the application of oil or grease, or any attention whatever, especially in machines where bronze bearings are used.

The principle as applied is to first bore out the bearings the required size to suit mandrel, then take and drill several rows of holes from end to end of bearing, size of hole varying according to size

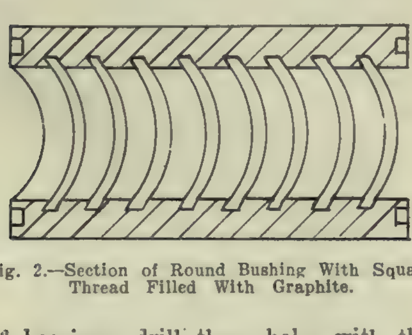


Fig. 2.—Section of Round Bushing With Square Thread Filled With Graphite.

of bearings, drill these holes with the second and following rows of holes directly under the spaces of the previous row of holes, thus the shaft or mandrel gets lubrication the entire length of bearing, (see Fig. 1). In a bearing, say 6 in. long, holes need to be about $\frac{3}{8}$ in. diam. and drilled as deep as possible without going right through casting, afterwards taking off the burrs round the holes and leaving a space about $\frac{3}{8}$ in. between each hole. Then fill each hole as tight as possible with a good quality of graphite. The bearing is then ready for use and will need no further attention. One supply of oil when machine is first started, is all that is required and will insure a cool, steady running machine.

Cast iron bearings are excellent. Without attention, bearings quickly heat and usually the spindle or shaft tightens as to be almost inseparable. The above method of placing holes in such bearings, fitted with graphite will be found to overcome this difficulty, and give every satisfaction. The use of graphite as a lubricant for bearings is of very great importance as applied to pulleys running either vertically or horizontal, and where it is difficult to get at them to apply oil or grease. The best method of fixing pulleys with graphite bearings is to procure a brass bushing, having hole bored to fit shaft. The inside may either have holes bored through as in bushings before mentioned, or two threads (square) may be put inside and the grooves and holes filled with graphite. Where two pulleys run together the bushing can be grooved at the ends and filled same as the holes (Fig. 2). The bushing is then forced into the pulley as tight as possible and pulley will need no lubrication as long as bushing lasts, besides being always clean and very economical.

DEVICE FOR FINDING CENTRES OF ROUND WORK.

By F. D. Sweet.

This little device if carefully made will engble one to accurately determine the centres of round bars, disks, and in fact any object of a circular form. A piece of 3-16-inch square brass rod about eight inches long is bent to form approximately a right angle, both legs being of equal length. A strip of brass, A, about $\frac{3}{8}$-inch wide and 1-16 inch thick is soldered to the ends of the legs. Equidistant between points X Y make a mark b. Another brass strip B of same size as A is soldered in place as shown, being careful to have edge C exactly on the line b and over the angle D. Fig. 2 shows method of using the device. Simply place it on the end of the bar or shaft; make a

Fig. 1

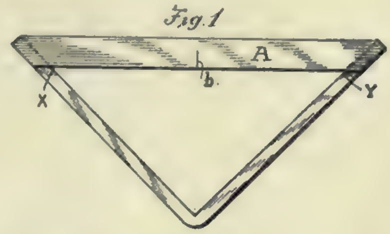
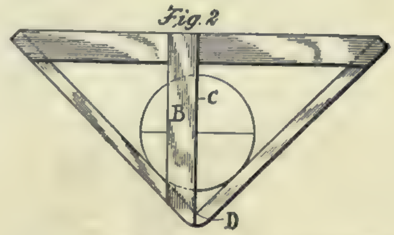


Fig. 2



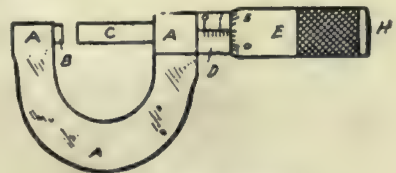
Device for Finding Centres of Round Work.

mark with scratch awl; give a quarter turn, and make another mark. The intersection of the lines will give the exact centre.—Scientific American.

TO READ A MICROMETER.

Every apprentice and mechanic should be able to read quickly and accurately a micrometer. The techical World Magazine explains fully how a micrometer is read.

The cut shows the usual form of a micrometer, the parts of which are as follows: A—frame, B—anvil, C—spindle, D—sleeve, E—thimble. The spindle is attached to the thimble at the point H, and the part of the spindle which is concealed within the sleeve and thimble is cut to fit a nut in the frame. Now, holding the frame stationary, the thimble is revolved by the thumb and finger and the spindle being



A Form of Micrometer.

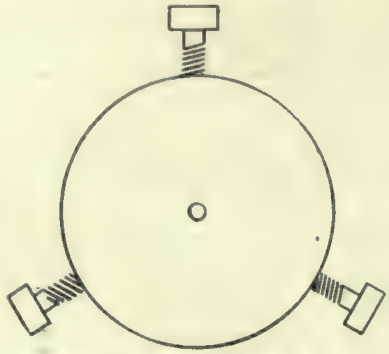
attached to the thimble revolves with it and moves through the nut in the frame, approaching or receding from the anvil. The article to be measured is placed between the anvil and the spindle and measured on the opening

between the anvil and the spindle, as shown by the lines and figures on the sleeve and thimble. The pitch of the screw thread on the concealed part of the spindle is 40 to 1 inch. One complete revolution of the spindle, therefore, moves it longitudinally 1-40 of an inch which equals twenty-five thousandths of an inch. The sleeve is marked with 40 lines to the inch according to the number of threads on the spindle. When the micrometer is closed the beveled edge of the thimble coincides with the line marked zero on the sleeve and the zero line on the thimble agrees with the horizontal line on the sleeve. Open the micrometer by revolving the thimble one full revolution or until the zero line on the thimble again coincides with the horizontal line on the sleeve. The distance between the anvil and spindle is then 1-40 or .025 of an inch and the beveled edge of the thimble will coincide with the second vertical line on the sleeve. Each vetical line on the sleeve indicates a distance of 1.40 of an inch. Every fourth line is made longer than the others and is numbered 0, 1, 2, 3, etc. Each numbered line indicates a distance of four times 1-40 of an inch or 1-10 pf an inch. The beveled edge of the thimble is marked in 25 divisions and every fifth line is numbered from zero to 25. Rotate the thimble from one of these marks to the next, moving the thimble longitudinally 1-25 of twenty-five thousandths or one thousandth of an inch. Rotate it to the division indicating two-thousandths, etc. Twenty-five divisions will indicate a complete revolution or 1-40 of an inch. The method of reading a micrometer is, therefore, to multiply the number of vertical divisions visible on the sleeve by 25 and add the number of divisions on the bevel of the thimble from zero to the line which coincides with the horizontal line on the sleeve. For example, in the cut 7 divisions are visible on the sleeve. Multiply this number by 25 and add the number of divisions shown in the thimble which is 3. This will give 7 X 25 which equals 175. 175 plus 3 equals 178. The micrometer is open one hundred, seventy-eight thousandths.

DEVICE FOR THREADING LARGE PIPE.

By K. Campbell.

The device illustrated herewith, is used to turn a thread on a large pipe in a lathe. The one illustrated has a small hole in the centre in which the lathe centre rests. This hole can be made larger and threaded. It can then take the place of the face plate. It is a much easier matter to centre the pipe in the lathe when this latter method is followed. The screws hold the pipe in the lathe tight enough to prevent the pipe turning on the studs when the pipe is being threaded.



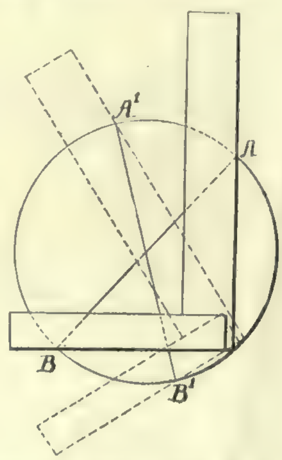
Device for Threading Large Pipe.

In the tailstock end, a V-shaped casting can be used, a centre being turned to take the place of the lathe centre. When the pipe is tightened in the lathe this cast iron centre brings the pipe at once to the centre.

QUICK MEANS FOR FINDING THE CENTRE OF ROUND SHAFTS.

By Albert Prather.

In illustration the circle represents a section of a shaft, the centre of which it is desired to find. The corner of a square is placed on any point of the circumference. The points A and B are the intersections of the outer sides of the square with the circumference. Draw



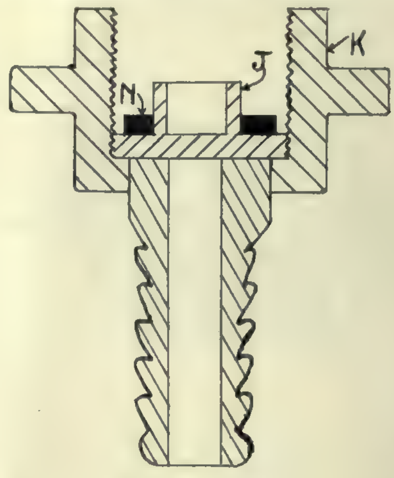
Method of Finding Centre of a Circle.

a line from A to B. Now shift the square a little, as represented by the dotted square, and with the corner on any other point mark the intersections A' and B', then connect A' and B', and the intersection of A B and A' B' will be the required centre. It is necessarily the centre, for it is the intersection of two diameters.—Scientific American.

AUTOMATIC VALVE FOR USE WITH PNEUMATIC TOOLS.

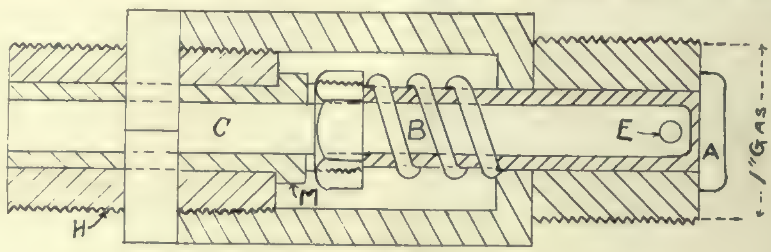
By S. B. Kennedy.

The accompanying sketch shows an automatic valve slightly different from



Hose Connection.

a type I have seen in use. The ones I refer to, are minus the spring and some-



Automatic Valve for Air Hose.

times give trouble by refusing to close after the hose nut is unscrewed. A glance at the sketch will show how it operates. When hose nut is screwed on to nipple (H) the spigot (J) inside of nut makes contact with carrier (C) which lifts the valve (A) and allows the air to enter at (E). These valves are very handy where several branches are needed for you can have a stop-cock on the service pipe and as many branches as you wish working independent of the stop-cock.

(E)—$3\frac{1}{4}$ in. holes through which air will pass when valve is raised by coupling an air hose.

(B)—Spring to ensure valve closing.

(J)—Spigot (J) makes contact with carrier.

(C)—Raises valve when hose nut (K) is screwed on to nipple (H).

(N)—Leather washer.

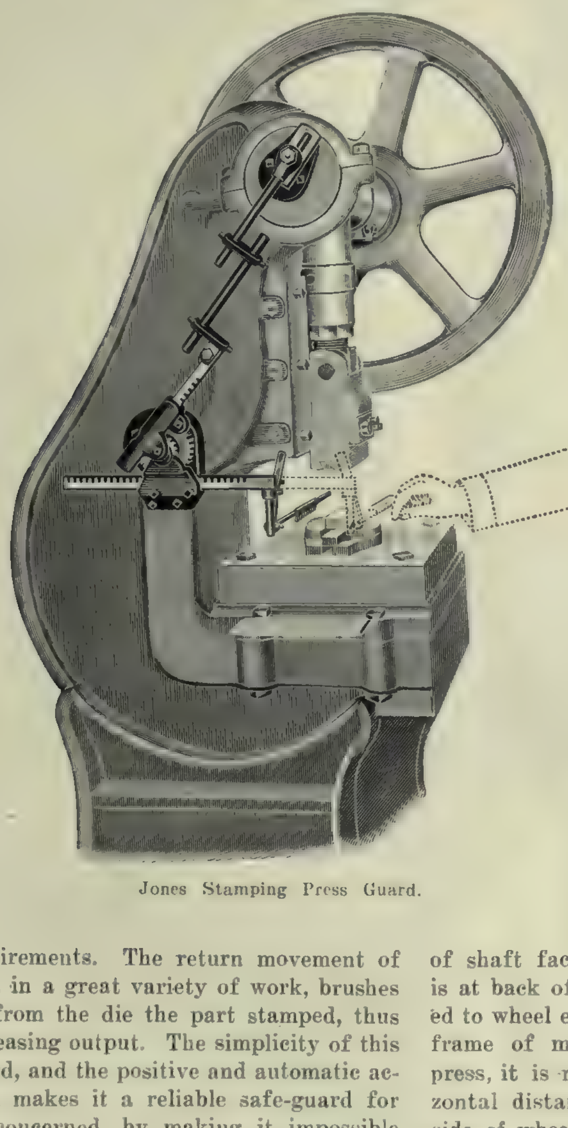
DEVELOPMENTS IN MACHINERY

New Machinery for Machine Shop, Foundry, Pattern Shop, Planing Mill; New Engines, Boilers, Electrical Machinery, Transmission Devices.

JONES SAFETY DEVICE.

The device shown in the illustration, attached to a Brown, Boggs Press, is one of a number of devices manufactured by the Jones Safety Device Co., Hamilton, for jointers, saws, shapers, presses, etc. The guard was shown at the Canadian National Exhibition and received considerably attention.

This guard is positive in action, which renders it a most effective guard for presses. It is easily attached to any press, and is readily adjusted to meet all requirements. The return movement of arm, in a great variety of work, brushes off from the die the part stamped, thus increasing output. The simplicity of this guard, and the positive and automatic action, makes it a reliable safe-guard for all concerned, by making it impossible for accidents to happen when this guard is in operation.



Jones Stamping Press Guard.

Hall's Cold Cut-off Saw.

The following are the directions for attaching stamping press guard:—Attach metal box holding toothed wheels to side of machine frame so that long rack arm will be about six inches above, and parallel with bed plate of press; holes for attaching this box should be tapped one-half inch. Attach disc to end of shaft above, by using a three-eights inch tap, in such position that its mate when placed on it will have its slot in line with the short rack arm below. In setting guard to die always keep guard arm as close as possible to back of die; then set stroke to suit work.

For style of press in which the end of shaft faces the operator, and wheel is at back of press, the guard is attached to wheel end of shaft and alongside of frame of machine. For this style of press, it is necessary to know the horizontal distance from end of shaft outside of wheel to back edge of bed plate.

HALL CUT-OFF SAW.

The cut-off saw here illustrated is for cold sawing bar iron and steel, round, square and other shaped stock up to four inches. The saw is driven through hardened steel gears, hardened steel hobbed worm-wheel and hardened steel worm, supplied with splined worm shaft. The saw carriage is gibbed to frame, and latches when clear back. It has gravity feed, adjustable by moving weight out on lever, The tight and loose pulleys on worm shaft run 600 r.p.m. Weight, 385 lbs., skidded. The machine is built by John H. Hall, Brantford.

LARGE SLOTTER FOR RAILROAD WORK.

In the design of this slotter advantage has been taken of the experience of many of the largest users of slotters, particularly in railroad shops, where the heaviest service is required. Weak spots have been eliminated, many conveniences have been added, and simplifications have been made in construction.

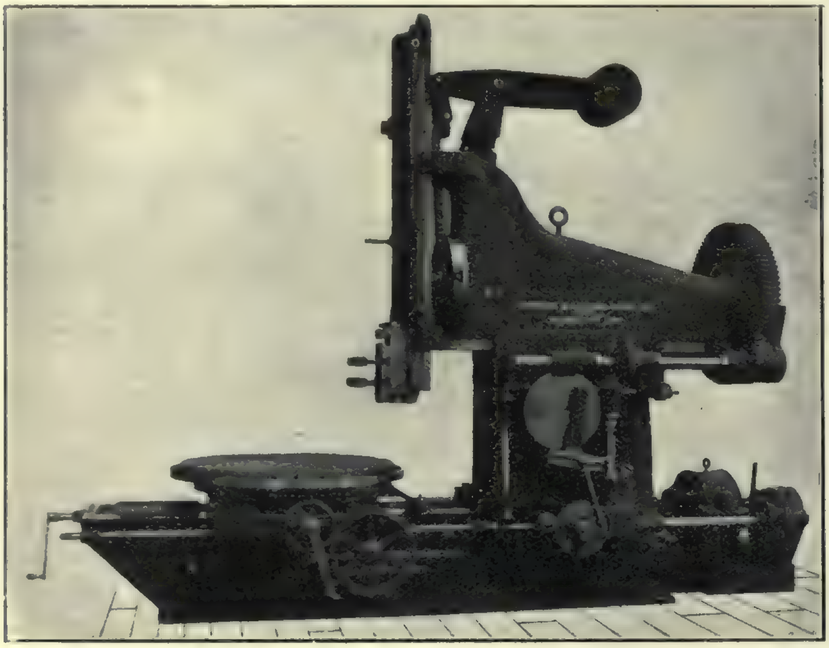
The essential features in design are the movable head and the quick power adjustments to head and to all motions of table. Coupled with these are the minor improvements of extra quick return to ram, stroke indicator, automatic throw-out to feed, etc,

The traveling head is the striking feature of this machine, and its great value is very apparent, especially on large work, where the work cannot be readily moved. This construction also makes it possible to do work requiring a great reach. This construction at first hand is criticized on account of the spring of head under heavy work. In actual practice this spring is found under same conditions to be very small, owing to the fact that the upper thrust is taken by two massive bolts running clear through and anchored in base. Also the column is made very deep and heavy, and the head being well scraped thereto, makes spring practically impossible. Moreover, when the head is close back to column the maximum stiffness in any slotter construction is reached.

The quick power traverse and adjustment to head and table can be thrown in and out while the head is running or standing, as described. It is claimed that the quick power feature on certain classes of work means an increase of 200 per cent. in output. By this feature as a general proposition this machine will do 50 per cent. more work than a standard machine. The quick return is of special construction, giving remarkably even cutting strokes, with very fast return. An indicater is provided, showing amount of stroke.

Feeds have a wide range and are operated without cams of any description, are adjustable and reversible while machine is in operation. A safety device automatically throws out feed in case of any obstruction.

The table is large and of heavy pattern and clamped by means of four corner bolts. Circular table is graduated in degrees. Cross slide and bottom slide are of large size and accurately scraped and gibbed to place. Cutter bar has square bearing in guide, to which it is accurately scraped. It is conveniently raised and lowered by crank handle working into screw. It is also provided with relief apron hinged to ram.



Large Slotter Built by London Machine Tool Co., Hamilton, for I. C. R. Moncton.

The gearing is all of wide face and coarse pitch, cut from the solid, making it possible to take enormous cuts at high speed. All shafting is carefully turned and ground and made of special high-carbon steel. Slotter is arranged for belt or motor drive. If motor drive is used a 3 to 1 variable speed motor is preferred.

Maximum stroke—24½ inches.

Will cut to the centre of a circle 7 ft. 6 in. dim.

Will cut to the outside of a circle 9 ft. 2 in. diam.

Diameter of table, 4 ft. 6 in.

Distance table to head, 2 ft. 5 in.

Adjustment of ram, 2 ft. 8 in.

Strokes per minute, 7 to 34.

Horse-power of motor recommended, 10 (3 to 1 variation).

Countershaft pulleys, 24 in. dia. by 6 in. belt.

Speed of countershaft pulleys, 200 r.p.m.

Weight, 32,000 lbs.

The slotter illustrated is for the I.C.R. shops, Moncton. They are being manufactured by the London Machine Tool Co., Hamilton.

R. McDOUGALL 16-IN TOOL ROOM LATHE.

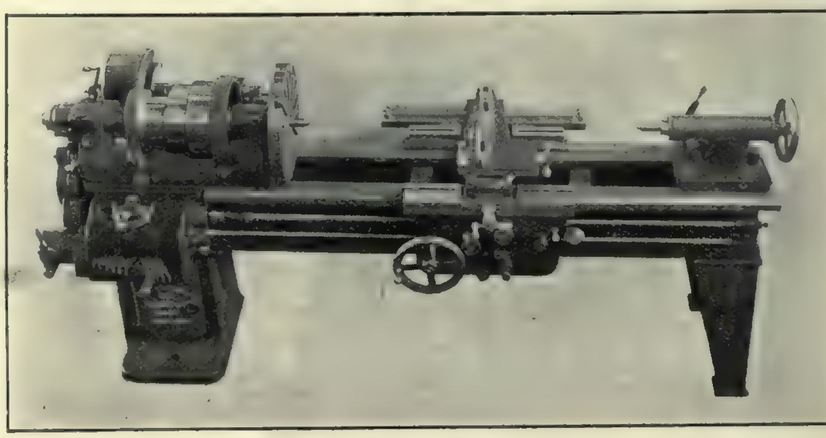
The accompanying cut shows a tool room lathe, being one of the latest productions of the R. McDougall Co., Galt. The special features of the lathe are the quick change gears and double back gear.

The table attached to the speed box shows notches in which to put levers for cutting different threads. Speeds can be changed from 2 to 128 by the operation of the two levers. This construction allows a quick change of gears without changing the gears at the end of the lathe.

The head is made with a three-step cone and the double back gear gives more changes of speed.

The carriage has a screw-cutting index so that the lead screw may be dropped into the right notch when the carriage is brought back by hand instead of waiting for it to be carried back by power.

Each handle on the rest has a micrometer gage and the whole lathe with its massive build, is fitted for tool room work, for which it is designed.



R. McDougall 16" Tool Room Lathe.

IMPROVED NO. 3 CHICAGO (DUPLEX) HAND MILLER.

The hand millers manufactured by the Chicago Machine Tool Co., Chicago, Ill.,

are of the duplex type, so called since a vertical attachment is furnished with each machine. This combination of both the horizontal and vertical spindles on

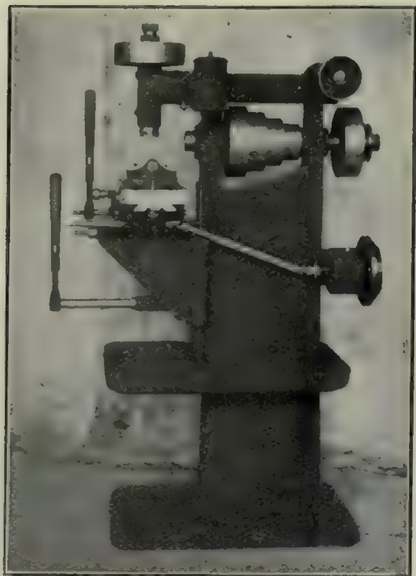


Fig. 1.—No. 3 Machine With Vertical Attachment in Place.

the same machine, adapts it for the quick handling of a large variety of work. The builders have lately made some notable improvements in the No. 3 size of the machine, which makes it adaptable for doing a lighter class of work than that ordinarily performed.

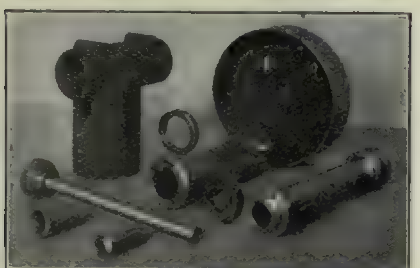


Fig. 2.—Parts of Attachments.

In Fig. 1 is shown the No. 3 machine, with the vertical attachment in place. This vertical attachment is among the important features of the machine, making it particularly adapted to the toolroom purposes, as well as for brass work-

Fig. 3.—Parts of Horizontal Spindle.

ers, and manufacturers of small parts, such as locks, typewriters, guns, sewing machines, speedometers, spark coils, etc.

As may be seen, the machine is strongly constructed throughout. The table has an extra wide bearing on the saddle, insuring absolute rigidity, an essential feature in a machine of this kind.

Fig. 2 shows parts of vertical attachment. The spindle is bored for a No. 9 Brown & Sharpe taper. This spindle runs in a split bronze bearing. The latter has a slot cut through it running the entire length of the bearing, and in this slot is laid a wick. The casing, which contains the spindle bearing, spindle and parts, is split and provided with screws for taking up any wear in the bearing. In this casing is an oil reservoir. The ends of the wick, are dipped into this reservoir, which contains enough oil for about a year's running. In Fig. 2 also, may be seen the drawbar, the sleeve and the collet. End mills are held in place in the vertical attachment by a drawing in collet, the collet being interchangeable on the vertical and horizontal spindles.

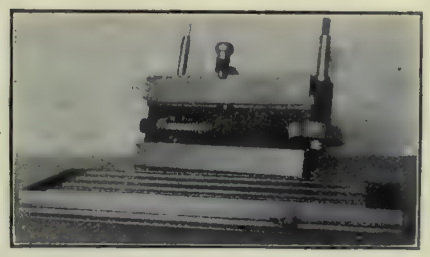


Fig. 4.—Spiral and Worm Gears.

Fig. 3 shows the parts of the horizontal spindle, the spindle proper, and the bronze bearings, which are fitted to taper bores in the column. It will also be noticed in this engraving that adjusting collars are provided for taking up any wear which may occur in the bearing.

The power feed is taken from a cone pulley on the rear end of the spindle to a three-step cone pulley on the rear of

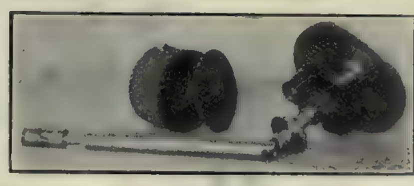


Fig. 5.—Gear Feed Box and Universal Shaft.

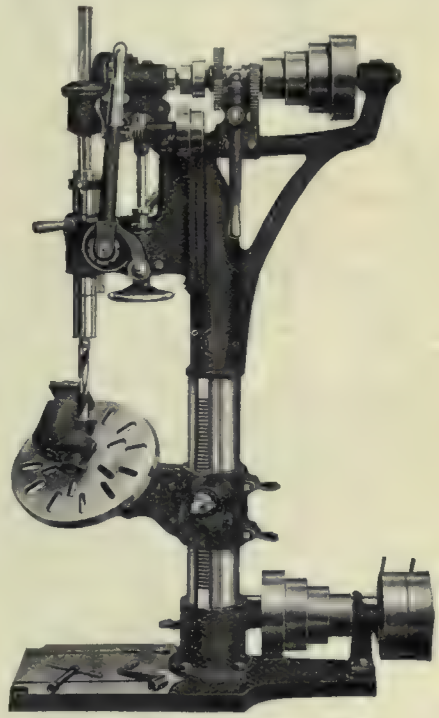
the gear box. From the gear box the drive is through a universal joint shaft to a pair of 45-degree angle spiral gears in the saddle. As shown in Fig. 4, a worm is fastened in the same shaft with one of the spiral gears, the pair of spiral gears and the worm being held in the rocker. This rocker throws the worm in and out of mesh with the rack in the table.

The arrangement of the feed gear box and the universal shaft, which transmits the power feed to the table may be seen in Fig. 5.

The feed gear mechanism consists essentially of a set of planetary gears through which the desired reduction of the spindle speed is obtained to give the proper transmission of power to the table. The cone pulleys, which transmit the power from the spindle to the feed gear box are interchangeabile, giving in all six changes of speed.

ROBERTSON 21-INCH DRILL.

The drill illustrated herewith is a new machine, having a tilting table. The knee of this tool is made in halves with planed surfaces, tongue and grooved and bolted together. At right-angles to the column bore is a large bearing, receiving a swivel stem in which the table stem is set. This swivel stem, in the knee,



Robertson Improved 21 Inch Drill.

has a cut worm gear, in which engages a worm having a square-ended stud extending on each side of the knee, for operating the table to either side by wrench. Both the swivel and knee have a flanged face, which is graduated from 0 to 90 degrees.

A gas engine cylinder is shown clamped to the table, which has been swung at the desired position so as to drill a side outlet at the proper angle. The table can be swung into a vertical position and can then be turned on its centre bearing so as to bring any desired portion of the work under the drill. As there is almost no limit to the way in which the work can be held for drilling, many different uses for it will be found in almost every shop.

This tool is also furnished with a very convenient form of back gearing, a movement of the lever to either side changes from belt to back gearing, while the machine is in motion or a half mavement can be used as a stop motion.

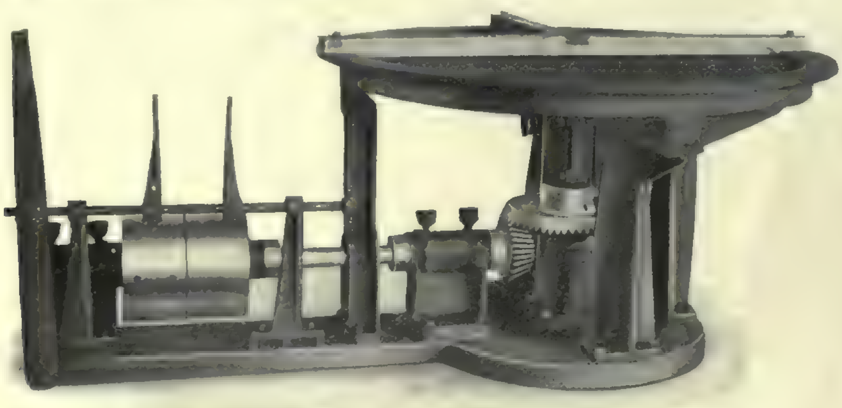
The Robertson Drill & Tool Co., 1848 Niagara Street, Buffalo, N.Y., are the manufacturers of this drill.

BESLEY HORIZONTAL DISK GRINDER.

The accompanying illustration shows a new 48-inch horizontal disk grinder brought out by Charles H. Besley Co., 15 So. Clinton St., Chicago, Ill. This machine is designed for grinding large surfaces such as fire doors, door jams of furnaces, stove doors, and large gear case covers for automobiles.

The method by which the machine is driven is clearly shown in the illustration. The belt runs on a 12-inch diameter pulley from which the power is transmitted to the grinding wheel spindle by means of a 2-inch horizontal shaft and bevel gearing. The vertical spindle, to which the large bevel gear is attached, is 3 inches in diameter at the bearings and 6 inches in diameter at the wheel collar, and is provided with a pilot 2 inches in diameter for holding and centering the disk wheel. The thrust is taken by two hardened tool steel blocks, one of which is secured to the lower end of the spindle and rotates with it, while the other is secured to the bed plate. Proper attention has been given to the lubrication of this thrust bearing.

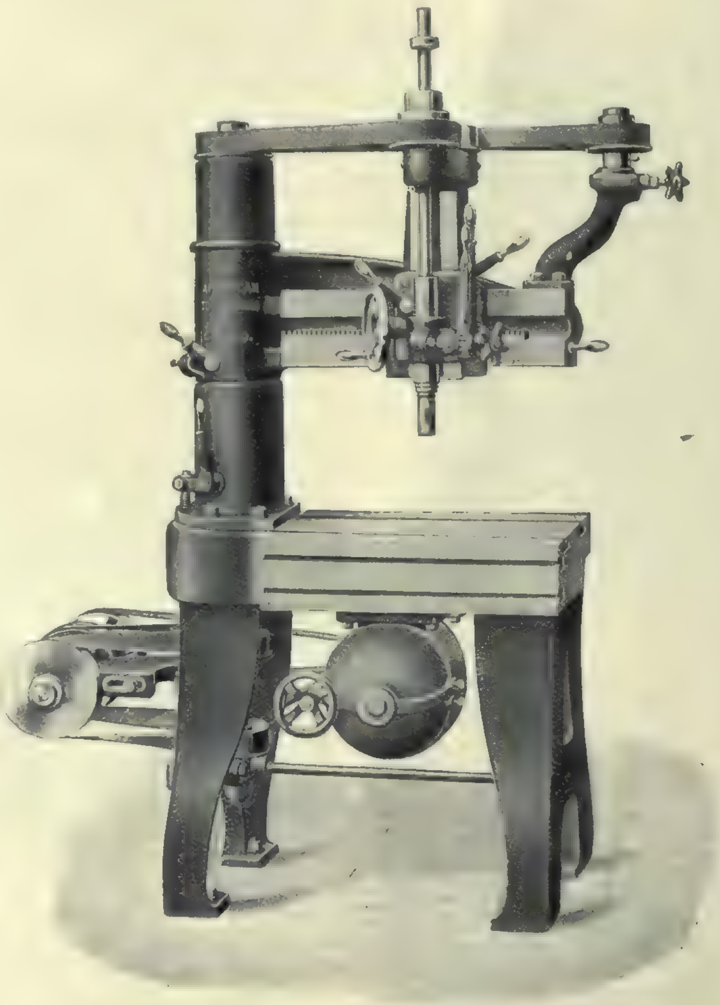
The spindle and driving-shaft bearings are 9 inches long and are of the split type, babbitted and reamed. The disk wheel is 48 inches in diameter and provided with ribs radiating from the hub to the outer rim. The thickness at the hub is 2½ inches, betweeb the ribs ¾ inch, and at the rim 1½ inch. A guard ring is provided around the disk wheel, projecting ¾ inch above the face of the wheel. This prevents the work from flying off the disk wheel while being ground. The top surface of the guard ring is machined true with the face of the disk wheel, so that bars, jigs, etc., for holding the work to be ground can be secured to it. The speed of the disk wheel is 400 r.p.m., and the bevel gearing being in the ratio of 1 to 2, the driving shaft should run at 800 revolutions per minute. The machine can be driven either direct from the line-shaft or from a countershaft as required.



Besley No. 19, Forty-Eight Inch Horizontal Disk Grinder.

HIGH SPEED SENSITIVE DRILL.

In connection with the High Speed Sensitive Drill described in the April issue of Canadian Machinery, the American Tool Works Co., Cincinnati, have brought out some special designs in addition to the original product.



High Speed Sensitive Radial Drill.

The illustration represents the 2-ft. motor driven drill, with tapping attachment, which machine has attracted great attention among the master mechanics and master car builders at their June convention at Atlantic City.

The motor is mounted beneath the box table, and is direct connected to tapping attachment, driving shaft by a belt. The motor is a Lincoln variable speed, 3 to 1. with speeds 525 to 1,275 r. p. m.

This drill will handle high speed twist drills up to 1 inch diameter and will take care of 1 inch taps.

A further development of this drill will appear in the November issue of Canadian Machinery.

VERTICAL TYPE KEY-SEATING MACHINE.

This machine is designed for general key-seating, and although being very simple in construction and operation, it is entirely automatic, having automatic feed, automatic release for the cutter and automatic stop for any depth keyway required.

The machine has a tilting table for cutting tapered keyways when required. The cutter might be called a broaching bar, carrying 10 teeth cutting their proportional part at each action of the bar. This bar having a series of teeth cutting together to each action of the bar reduces the number of strokes to accomplish the work over ordinary key-seating machine using a single cutter.

The work to be done is first put on to a so-called work bushing fitting the hole in the work and fastened down by means of a clamping arm, one end resting on the work and the opposite end on a post adjustable to the height of the work and fastened down by means of a screw and having hand wheel to operate same.

The machine is then started by means of the lever, marked No. 1 on print, and the depth desired to be cut is regulated by means of the depth regulator, which is set in any of the holes in the index plate, and as the index plate revolves when the machine is in operation the depth regulator or finger comes in contact with a cam on the operating lever which stops the machine. The index plate has a division of 40 holes graduated for depth of .010" between each hole, so that the depth regulator can be set for any depth desired and will stop the machine automatically when coming in contact with the operating lever.

The cutter is fed by means of a wedge sliding on the back of the bar, automatically advanced to every motion, and automatically released on its return by allowing the wedge to drop back half the distance of its advance. By this movement the cutter can be released from rubbing on the work on its return. This movement of the wedge by advancing and returning half way is continued until the machine is automatically stopped to the depth desired. The movement of the bar is so arranged to have a quick return.

The machine is so arranged that it can be operated by hand when desired. It has tight and loose pulleys so that it can be belted direct to jack or main shaft, requiring no countershaft. The loose pulley is provided with a self oiling bushing which will run for a year or more without any attention.

It is manufactured by the Lapointe Machine Tool Co., Hudson, Mass.

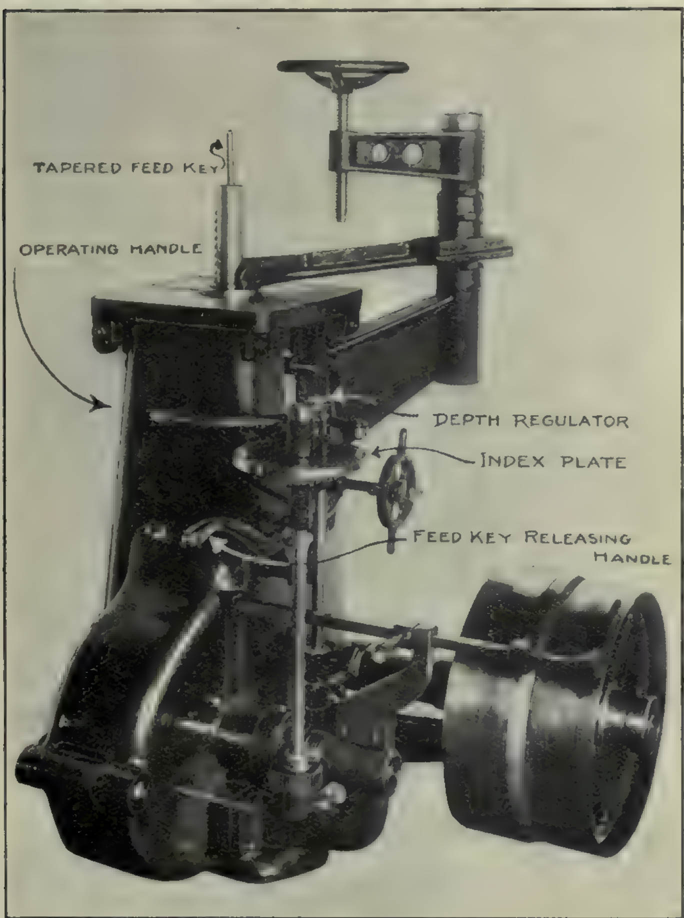


Fig. 1.— Lapoint Keyseater—Side View.

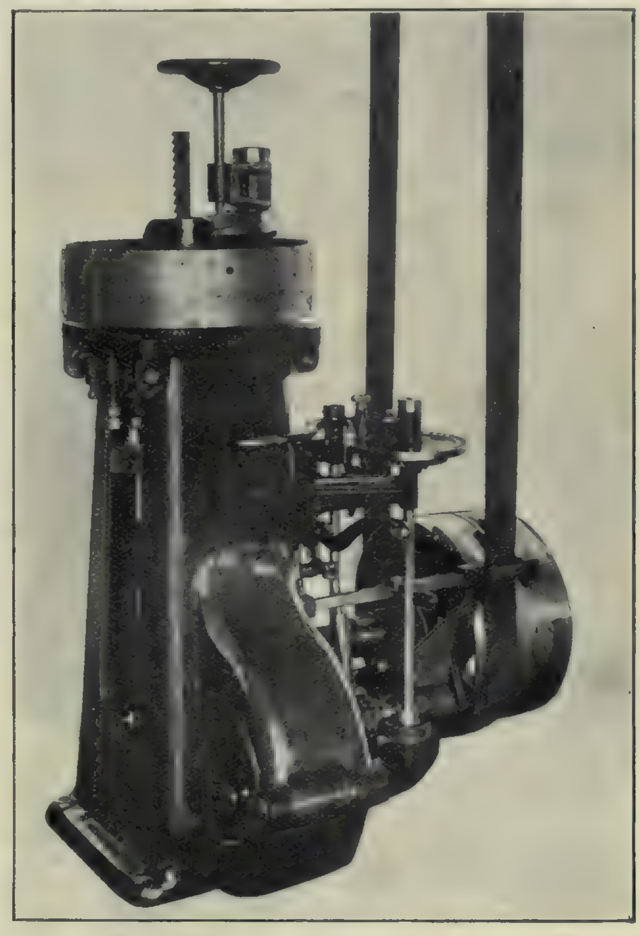


Fig. 2.—Lapoint Keyseater—Back View.

Interesting experiments have been made by the railway commission at Ottawa with fireproof paint as a means of protection for wooden trestles and bridges. After the trestle had been painted with fireproof paint, an engine was run slowly over it and ashes shaken out. Nothing resulted. The engine was then brought to a standstill in the centre of the bridge and red hot cinders shaken in a heap on the painted ties. The fire practically went out in a few minutes. In another case treated similarly, the paint was burned, but no fire resulted. There will be further experiments.

Smoke prevention is possible. There are many types of furnaces and stokers that are operated smokelessly.

In an acetylene-gas compressing plant, the job that is refused by the man who knows might be readily accepted by the man who doesn't.

CANADIAN MACHINERY
AND MANUFACTURING NEWS

A monthly newspaper devoted to machinery and manufacturing interests mechanical and electrical trades, the foundry, technical progress, construction and improvement, and to all users of power developed from steam, gas, electricity, compressed air and water in Canada.

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Vol. V. October, 1909 No. 10

NEW MACHINERY HALL NEEDED AT THE CANADIAN NATIONAL EXHIBITION.

No annual feature in the life of the Dominion is greater than the Canadian National Exhibition. Whereas other countries hold at wide intervals and in honor of some special event or anniversary great displays which are dubbed "world's fairs," and which, on account of their infrequency and irregularity, have little influence on national life, Canada has in the National Exhibition a great national fair, which is the result of years of development and which therefore has all the characteristics of a national event. It is as unique a feature as the great fair of Nijni-Novgorod, which is typically Russian, just as this is typically Canadian. They are both merely the perfection of the ordinary county fair, and this gives them all their beauty and their value.

The thirty-first season of the great Exhibition now belongs to the past and this year it was a greater success than ever before. In fact, the growth of the Exhibition becomes more remarkable with every time it is held. There are no signs that it has yet arrived at anything like its full growth. On the contrary, everything seems to point to its great development into the greatest annual fair in the world, a position it is already the second largest institution of the kind on earth, and it begins to be doubtful if even the great fair at Nijni-Novgorod surpasses it materially. But mere size is not everything. Even if there were many fairs surpassing in extent the Canadian National, this would not lessen its great national value. It would still serve as the great meeting place of Canadians from all parts of the Dominion. It would still bring them together as nothing else can do; and it would still make them acquainted with one another and with distant parts of their country in the best possible way—that is, through their productions. This is the great value of such an institution as this Exposition, and this is why Canadians of every province unite in "booming" it. They all realize that the Fair has grown beyond mere local restrictions, and that it is in every sense a national event.

The exhibits from the various provinces of Canada are always one of the features of the Exhibition. They stand in silent testimony to our vast wealth-producing Dominion and show the possibilities of a country, the resources of which are practically unlimited. Fruits, grains, mineral products, manufactured goods and products of the sea all combined to demonstrate the variety of the resources included between the Atlantic and the Pacific.

British Columbia, Alberta, Saskatchewan and Manitoba came from the west, and Quebec, and the Maritime Provinces from the east, combined with Ontario, and the result was the finest display of natural products that one would desire to see.

The growth of the Exhibition has necessitated the erection of new buildings. For several years manufacturers have been asking for a new Machinery Hall, and until it is built, one phase of Canadian life will be lacking at the convention. Three years age the exhibits of metal-working tools were greatly in evidence. This year there was one large exhibit. Interviewed by Canadian Machinery, machinery men were as one in the statement that lack of space and the cost of exhibiting were the reasons for not exhibiting, and this can only be overcome by the erection of a new Machinery Hall.

Dr. Orr told Canadian Machinery that we do not want dealers to exhibit. We do want dealers. We want every machine tool manufacturer and dealer in the Dominion, who can possibly attend, to have an exhibit. The Exhibition will never be complete until we have a complete line of machinery.

Each year some improvement has been made in the way of a new building and each year Machinery Hall has been neglected. A new Dairy Building was put up a few years ago, also a new Art and Natural History Building, a Process Building, Horticultural Building, new Grand Stand and a Transportation Building, all of which are a credit to the Exhibition. The progress of Canada along machinery lines and the interest machinery men of Great Britain and United States are taking in the development of Canada, is a living protest against the scant attention which has been paid to machinery at the Exhibition. Canada is a country of national resources, and one of the chief agents in the development of these resources is machinery. Canada is blest with enormous water powers waiting to be developed, the chimneys of large works are to be seen everywhere, and yet the largest manufacturers of, or dealers in, machinery in Canada are absent from Machinery Hall.

The educational value of a large exhibit cannot be overlooked. We are spending large sums of money on technical education, and here is a chance to give an excellent lesson and let mechanical men see the development in machinery lines at a small cost.

The fact is, that until a new Machinery Hall is built, manufacturers of machinery will have to use the blue sky for a covering, and this at a large expense, or else stay away from the Exhibition altogether. A building should be provided with a spur track running into it, permanent shafting, and an overhead crane running the whole length of it, so that the heaviest machinery could be easily transferred to its proper place. It was hoped by the manufacturers that this year would see some

betterment of the situation, but matters are getting worse. More manufacturers wish to display their machinery, and to do so are compelled to take space wherever it could be had, some erecting tents, so that they might have a place at the Canadian National Exhibition.

The whole issue may be summed up, that a modern Machinery Hall is needed at the Exhibition and that this hall can be made one of the best investments that the management could have. With such, manufacturers of and dealers in all lines of machinery will not only occupy space, but will go to sufficient expense to make the exhibit of decided educative value. For instance. one dealer intimated that he was willing to spend $2,000 a year if he could secure space at the Exhibition. It will, therefore, be seen that, though the building will be erected only at considerable expense, the returns for that expense will be sufficient to justify the expenditure. The question should be looked at from all points, the educational value, the greater attraction for mechanical men, manufacturers who require machine tools, etc. If this is done, it will be seen that a very liberal policy would be the best policy. Surely the Toronto Board of Control, and Council will see the value in taking the step immediately to erect the new building, as a great percentage of the people of Canada are engaged in the practical end of manufacturing. We are in hopes that before the opening of the Canadian National Exhibition in 1910 we shall be able to announce that a new, spacious and well-equipped Machinery Hall, equipped with cranes. permanent shafting, and a railway siding, has been added to the fine array of buildings.

THE SECRET COMMISSIONS ACT.

To prevent the payment or acceptance of illicit or secret commissions, an Act has been passed by the House of Commons at Ottawa, amended and approved of by the Senate and is now in force. It is to be known as The Secret Commissions Act and is applicable to the business of travelers or agents and manufacturers who employ them.

The Act is known as Bill 31 and reads as follows :

Everyone is guilty of an offence and liable upon conviction on indictment to two years' imprisonment, or to a fine not exceeding two thousand five hundred dollars, or to both, and, upon summary conviction, to imprisonment for six months, with or without hard labor, or to a fine not exceeding one hundred dollars, or to both, who,—

(a) being an agent, corruptly accepts or obtains, or agrees to accept or attempts to obtain, from any person for himself or for any other person, any gift or consideration as an inducement or reward for doing or forbearing to do, or for having after the passing of this Act done or forborne to do, any act relating to his principal's affairs or business or for showing or forbearing to show favor or disfavor to any person with relation to his principal's affairs or business ; or

(b) corruptly gives or agrees to give or offers any gift or consideration to any agent as an inducement or reward or consideration to such agent for doing or forbearing to do, or for having after the passing of this Act done or forborne to do, any act relating to his principal's affairs or business, or for showing or forbearing to show favor or disfavor to any person with relation to his principal's affairs or business ; or

(c) knowingly gives to any agent, or, being an agent, knowingly uses with intent to deceive his principal, any receipt, account, or other document in respect of which the principal is interested and which contains any statement which is false or erroneous or defective in any material particular, and which, to his knowledge, is intended to mislead the principal.

(d) Every person who is a party or knowingly privy to any offence under this Act shall be guilty of such offence and shall be liable upon conviction to punishment hereinbefore provided for by this section.

The latter clause was an amendment to the original bill which passed the Senate on March 31st last. After being amended it was sent back to the House of Commons and agreed to on April 21st and was finally sanctioned by the Senate.

The Practical Meaning.

The Secret Commissions Act, as its name infers, prevents the giving of secret commissions, rebates or considerations.

A traveler who sells an article to a company cannot legally give that company any secret rebate or commission to induce the latter to purchase from him. If the goods are sold for less than the manufacturers' price in the ordinary way, the sale will of course be legitimate in the eyes of the law ; but if the goods are sold for the manufacturers' price and the salesman puts his hand in his pocket and gives a rebate or commission to the purchaser then the sale is illicit and that salesman, if convicted, is liable to imprisonment for two years, or to a fine not exceeding $2,500, or both, as mentioned above.

One way that this has been done in the past was by the agent or traveler giving a purchaser the secret rebate in order to get his business and then charging up the rebate to his employer or the firm he represented as road expenses. The new bill makes such an act contrary to the criminal code.

In the event of the traveler or agent selling below the manufacturers' price and doing so openly that traveler or agent does not commit a breach of the law. The manufacturer, however, has the privilege of determining to whom his goods shall be sold and at what price and in such a case if he desires may refuse his goods to the house whose travelers or agents cut down his price.

A Concrete Example.

In the case of an article such as a machine, the giving of the secret commission could, up to the present, be easily accomplished. A traveler may probably have difficulty in selling a company a machine, but he knows that if he allows that company a rebate, he can sell him the machine. To get his business he does so by personally paying him a rebate. He gets his money back from his house in his expenses.

This system is sometimes used by a house anxious to get business and when the traveler for the house who does business "on the square" comes along, he finds he is up against a competition that he cannot legitimately meet.

Clause (d) in the above bill is the amendment that was made to it after it had reached the Senate. It makes the purchaser just as liable as the traveler or house he represents who is guilty of a breach of the act.

UPWARD MARCH OF CANADA'S TRADE.

In his presidential address to the Canadian Manufacturers' Association, Robert Hobson, president of the Hamilton Steel and Iron Co., made reference to the trade situation. He said:

"To appreciate the sharpness of the decline from which we temporarily suffered, it is only necessary to glance at the trade returns, and measure our purchasing power by the extent of our imports. For the twelve-month period ending June, 1907, our imports of merchandise were valued at 345 millions; last year they dropped to 323 millions, while this year they went as low as 303 millions. This represents a decrease of 42 millions in two years. More striking still is the comparison afforded by the twelve-month period ending March, which perhaps corresponds more closely to the period of the depression itself. Comparing 1909 with 1908, on this basis, the import figures show a falling off of 64 millions in the one year, with a corresponding decrease in customs collections of 10 millions.

"It is gratifying to note, however, that, judged even by this barometer, business is again on the mend. More recent returns, when compared month by month with the returns for 1908, show a decidedly upward tendency, the increase in imports of merchandise for June alone being seven millions. Statistics gathered from other sources only serve to confirm the belief that the worst is now well over.

"There are, of course, exceptions, for in some few industries the effect of hard times is still being felt. But, broadly speaking, the situation is improved; the trend of business is markedly upwards, and ere another year has passed I trust tne clouds will all have disappeared and we will again be enjoying the sunshine of prosperity."

As if to corroborate Mr. Hobson's remarks the August trade returns just published, show an increase of eight millions for the month, over last year's figures. The total trade for the month was $55,869,031, an increase of $7,761,972 as compared with August of last year. Imports of merchandise totalled $30,241,376, a gain of $7,189,371. Exports of domestic products amounted to $23,537,330, an increase of $626,791. Exports of foreign products totalled $1,726,341, an increase of $186,040. Customs duties for the month were $5,351,157, an increase of $1,170,970.

For the first five months of the fiscal year the total trade of the Dominion has been $247,788,335, a gain of $36,130,252, or about seventeen per cent. as compared with the corresponding period of 1908. Imports of merchandise entered for consumption have totalled $142,033,218, an increase of $29,566,672. Exports of domestic products were $96,935,925, an increase of $6,820,301. Exports of foreign products were $8,098,417, an increase of $2,100,303.

The August bank statement shows deposits on demand payable in Canada to total $228,397,679; deposits on notice, $472,591,818; deposits elsewhere, 81 in Canada, $70,807,662. The amount of call and short loans in Canada is $56,680,172, elsewhere $120,659,509; current loans, total, $543,154,663 and outside Canada, $30,661,437.

The production of pig iron in Canada for the first half of 1909, as reported by the American Iron and Steel Association, was the largest ever reported in a similar period: it was greater than the make of any full year prior to 1905. The details of the production, as compared with the first half of 1908 are as follows:

	1908	1909	Chg's.
Foundry and forge	51,640	84,890	I 33,250
Bessemer pig	60,225	99,639	I 39,414
Basic pig	195,209	165,112	D 30,097
Total	307,074	349,641	I 42,567

The total increase this year was 13.9 per cent. Of the iron made in 1909 there were 347,482 tons made with coke or bituminous coal as fuel, and 2,159 tons with charcoal. The coke iron includes a small quantity of ferrosilicon made in the electric furnace. The total production for four years past has been in long tons:

	First Half.	Second Half.	Year.
1906	282,010	259,947	541,957
1907	270,100	311,046	581,146
1908	307,074	256,598	563,672
1909	349,641	....	....

This year there was a decrease in basic iron and a gain in bessemer pig. The proportion of basic to the total was 47.2 per cent., and of bessemer, 28.5; against 63.5 and 19.6 per cent., respectively, last year.

MANITOBA'S LICENSE ACT UNPOPULAR.

A contagious form of indignation is spreading rapidly in the Province of Manitoba on the event of it becoming known that on November 1st, an act licensing all extra-provincial corporations goes into effect. Those who represent outside firms in Winnipeg and throughout the Province of Manitoba are the ones who are chiefly concerned, and since the act referred to was assented to on March 10 last, and only a comparatively short time remains to offer any resistance, it cannot be wondered that the feeling against it is keen. To a casual observer the introduction of this act would be a direct blow to the resident agent or broker doing business for an extra-provincial firm. Upon inquiry, however, it is learned that the sole purpose is to increase the revenue of the province. The purpose is quite legitimate should it be executed in such a way as not to be detrimental to other interests. No citizen of this province is going to complain about the Government endeavoring to collect revenue, provided it is justly exacted, since increased revenue means general material progress. This act as it is outlined, however, may and will undoubtedly increase the revenue, but that which the province will gain thereby, it will lose perhaps tenfold.

It is impossible to definitely ascertain what the direct effect will be should it be enforced in its present reading. But anyone, who is in any degree familiar with the business situation in Manitoba, must surely know that those who will be affected most, are men whose commercial interests in this province are widespread, and further that they are the men who form the major part of the industrial and commercial life of the province. If there is any province that contains and maintains by means of its peculiar commercial situation, resident brokers and commission representatives whose principals are incorporated in perhaps every country in the world, it is the Province of Manitoba. And for any Government to pass such an act as the "Extra-Provincial Corporations Act" in Manitoba is to strike a death-blow at the heart of the commercial life upon which the existence of that province most largely depends.

All extra-provincial corporations not already chartered to do business in Manitoba will be compelled to pay a license, which will be levied according to its capital stock,

or discontinue its business with the resident agent or broker under a penalty which is specified in the act—a fine of fifty dollars a day. Whether this is the act in force in Ontario or not, for Manitoba, at any rate, it is manifestly unjust and unfair.

The resident representatives are already paying their business tax, which, in itself, should be sufficient to enable them to carry on their business, irrespective of the firms they represent. And for a further tax to be levied upon the firms outside looks like a double tax. And again, is every firm which is represented here by a broker going to submit—according to the formalities of the act—a copy of its financial statement annually, which may or may not become public property? And this is only one of the many ridiculous requests. What will be the result? Corporations hitherto represented by a commission merchant will either withdraw altogether or have themselves represented by travelers. Can Manitoba afford to have any one corporation leave the field? The answer is emphatically NO, from every sane business man who believes in competition, and in having as many manufactured articles as possible in the province.

Several companies have intimated that they will withdraw from the field if forced to pay the license fee. At the present time the Manitoba Board of Trade, the Manufacturers' Association, and the Grain Exchange are working in harmony with the Brokers' Association, in the preparation of a concrete statement which will show the peculiar injustices of the act in the hope that with the aid of the Attorney-General, the date of the enforcement might be postponed in order to make the necessary amendments to suit requirements. The Attorney-General has already expressed himself as opposed to the measure.

ADVERTISING, A WISE INVESTMENT.

Quite recently an advertising solicitor for Canadian Machinery called upon an advertiser for a renewal order. The advertiser was not disposed to renew, declaring that he had received no replies to his advertisements, mentioning that they had been seen in Canadian Machinery. Failing to gain his point, at this juncture the solicitor requested to be shown through the shops, as he was particularly interested in the class of goods being produced there. While wandering with observing eyes through the various departments, the solicitor asked his companion how he happened to get in touch with the manufacturers of such a splendid selection of machine tools, which included presses, lathes, drills, threading machines and attachments.

"Oh," answered his companion (the managing director of the company) "I have been a reader of Canadian Machinery for years and always kept familiar with the new lines advertised."

"Did you mention that you had seen their advertisements in Canadian Machinery when writing to manufacturers," asked the solicitor.

The managing director turned on his heel and started for his office a smile passed over the features of the solicitor as he followed the retreating form of his companion into his private office where the renewal order was signed and handed over without a word.

The publishers' millenium will arrive when readers can be induced to mention the paper in answering advertisements. The more advertising a paper carries, the more can be spent in securing the best editorial matter. One way to help is for every reader of Canadian Machinery to mention the paper when writing for a catalogue reviewed in the editorial columns, or in answering an advertisement. It is a poor crosscut saw that does not pull sawdust to both sides of the log. In this case the advertiser will feel satisfied that the paper is doing him a good service and continue his patronage. The reader will reap his benefit in the quality and quantity of editorial matter the publishers will be able to secure with the increased funds at their disposal.

TOPICS OF THE MONTH.

A Canadian manufacturer who has just returned from England discussed the matter of a representative exhibition of Canadian manufacturers in London, with the commercial agents in England. The latter are favorable to this suggestion and Canadian manufacturers who are looking for export trade should take this matter up.

* * *

Some time ago the MacLean Publishing Co. announced that W. A. Gay, who has been doing work in British Columbia, was unauthorized to take subscriptions for the MacLean Trade Papers and Magazines. It should be understood that this is not Robert Gay of Toronto, or any relation of Robert Gay, who has been a faithful employe of the MacLean Publishing Co. for the past twenty years and is likely to remain for another twenty.

* * *

The Manitoba Government has announced, that in accordance with the arrangement made at the last session of the Provincial Legislature, it has appointed the commission to consider the matter of the Workmen's Compensation for Injuries Act, and report as to whether it would be a measure best suited to the Province of Manitoba. The commission consists of three—Hon. Justice Locke, Morden, Chairman; A. W. Puttee, who will represent the workmen, and T. R. Deacon, manager of Manitoba Iron Works, representing the manufacturers.

* * *

The annual convention of the Canadian Independent Telephone Association, held in Toronto September 8, has served to show that the independent systems will play an important part in effecting the transfer to public control in Ontario and Quebec. There are now between 26,000 and 27,000 independent telephones in use in Canada. At present the greater number of these are used in public service and rural districts. The independent telephone would be the proper one for factory intercommunication, the expense of a "central" being entirely eliminated.

* * *

The committee selected to solve the Quebec bridge plans met in Montreal on September 7. It was decided to call for tenders for both the cantilever and suspension types of bridge, and the final choice will then be determined by the relative cost and the time required for building. Several important changes were decided upon. The new bridge will be 150 feet above high tide for 600 feet in the centre of the river; it will also be 24 feet wider than the old bridge, which was only 61 feet wide. The centre span will be reduced from 1,800 to 1,715 feet by building a new pier 100 feet farther from the north shore than the present pier. On the south side the present pier will be widened and strengthened, so as to bear the greater weight. Nickel steel will be used in the eye bars and for compression members, and, in brief, the new structure will be made as safe and strong as human ingenuity and skill can make it. It is expected that a start will be made very shortly, as this meeting has removed many of the causes of delay.

POWER GENERATION AND APPLICATION

For Manufacturers. Cost and Efficiency Articles Rather Than Technical.
Steam Power Plants ; Hydro Electric Development ; Producer Gas, Etc.

TRANSMISSION OF POWER BY ROPES*

Rope drive is applied to the driving of machinery when the motion is not constant. By a simple combination of fast and loose sheaves, this is most effectively carried out in large cotton fac-

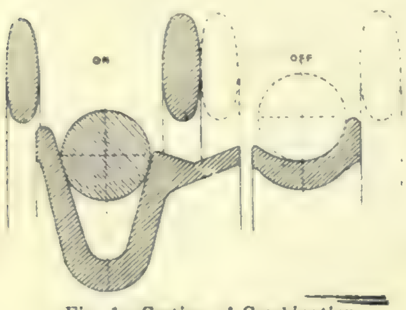


Fig. 1.—Section of Combination.

tories. The power is carried from a line shaft running the whole length of the room to numerous ring frames by means of ropes. The ropes are only 13-16 in. in diameter and the flange is not more than 1 in. in thickness.

Besides being extensively used in the cotton trade, fast and loose rope pulleys are also attached to the overhead gearing of lathes, to mortar mills, to milling and in fact almost every class of machinery requiring inconstant rotary motion.

Fig. 1 shows an approved section of this useful combination, which is protected by Royal Letters Patent, by William Kenyon. it will be observed that a shallow intermediate groove is turned

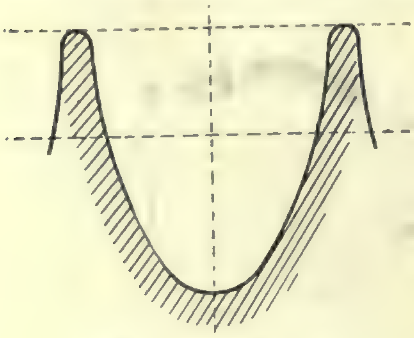


Fig. 2.—Curved Groove.

upon the fast pulley in which the rope gains a revolution before passing to its work. This insures a gradual start or knock-off when required and provides a most sensitive action. The position is also indicated of the rope shifter or fork which generally takes the curve of the pulley, allowing just sufficient room for clearing the rim in passing. In the frames shown in the first articles the forks are operated from the side of the guard boxes.

Grooves.

One of the most important items in rope transmission, as far as mechanical arrangements are concerned, is the construction of the grooves. Many and varied are the shapes and angles which have at different periods been submitted for guidance in the selection of suitable sizes of ropes, represented by badly-cut templates in wood, tin, cardboard, and the like, which have served rather to baffle than enlighten the judgment of the manufacturer. When templates of existing grooves require to be taken, the most correct, as well as the easiest method, is to obtain a plaster cast, which when trimmed off, gives an exact impression. Before making the mold, it is advisable to clean and grease the groves.

At one time engineers thought grooves should bear some resemblance to the rope itself and curved sides were introduced as Fig. 2. Where grooves of this description are employed, it is generally found necessary to increase the diameter of the rope to the utmost limit, not only to make up for the loss of power but to prevent as far as possible, the rolling action often induced thereby.

The angular groove is the proper groove. For all sizes below one inch, a 30 degree groove should be used and 40 degrees for all sizes above one inch diameter.

Setting Out 40 Degree Curve.

Instead of commencing with a circle to which the groove sides are merely tangent, it is always as well to presuppose the wedge shape, and build up the grooves with a view to preventing the rope reaching the bottom, or any part of the curve with which it terminates. Credit is due to Mr. William Kenyon for discovering a method of setting out a groove, which is both simple and accurate.

Referring to Fig. 3, it will be seen that the first process is to draw a circle representing the diameter of the rope through which the vertical and horizontal centre lines are projected. Afterwards the chord of the arc "A B" is marked off. This becomes the standard of future measurement, and points the centre of the curve terminating the groove from the centre of the circle, and when repeated downwards, fixes the apex

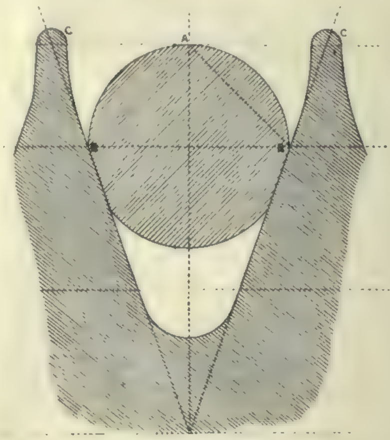


Fig. 3.—Laying Out a 40-Degree Groove.

of the angle, which always comes out at 40 degrees whatever the size of the rope may be. Extend the lines of the angle through the point "B B." cutting off segments of the circle on the way, until they intersect the upper horizintal line at "C C," which points fix the radius of the flanges from "B," and also ascertain the thickness of the metal. Thus the wedge, plus a little elongation due to pressure, is anticipated.

In many large installations, the flanges at "C C," which are designed to save width, are entirely discarded, and the

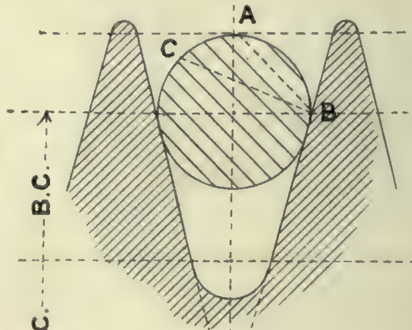


Fig. 4.—Laying out a 30-Degree Groove.

groove angle is carried forward to the terminals which are simply rounded off. Flangeless grooves allow a wider range of rope diameters, which may be increased to the utmost limit of the angle,

* Third article of a series describing the system of rope drive used by William Kenyon & Sons.

initial energy and pulley sizes permitting, thus securing an accession of transmitted power.

Laying Out 30 Degree Groove.

The same formula may also be applied in the construction of a 30 degree groove, Fig. 4. But for the more acute angle a longer measuring staff is required, and this is indicated by a 45 degree set square, making the chord of the arc "B C," doubling which fixes the apex of the angle.

Lubrication is best effected during the making, and is seldom necessary afterwards unless the ropes are running in an unusually dry atmosphere; even then a moderately hard composition lightly applied is all that is necessary. Soft greasy compounds only tend to damage the ropes, fill up the grooves, and induce slipping. When ropes have been so treated, or should they be splashed with oil from the bearings, a liberal application of whiting is advisable, which after absorbing the superfluous grease, will peel off in scales. After this the grooves should be thoroughly cleaned

Compressed Air and Vacuum Cleaning System

The Toronto Street Railway Use the McCabe Combined System with Great Success—Description and Tests of the Compressor and Equipment

In the McCabe system, in permanent instalations, compressed air is laid on by a suitable compressor in a convenient place in the building with piping, usually consisting of one small pipe usually ¾ in. running from compressor tank to top storey and dust discharge pipe running similarly from top floor to basement, with suitable valves at each floor, or where there is no portable plant, air is obtained from a portable apparatus and led by a pipe to the room or article to be cleaned.

The vacuum apparatus is then attached. The essentials of this apparatus are roughly a short pipe in which a nozzle is fixed so that it points (parallel with the pipe) toward one end, known as the discharge end, and the nozzle is then connected with the compressed air pipe. The compressed air discharging out of the nozzle into the pipe drives the air in the pipe towards the discharge end, creating a vacuum at the inlet or vacuum end, thus causing a current of air to move at a high velocity in at the inlet past the compressed air nozzle and out at the discharge. The pipe and compressed air nozzle are specially designed to give this result, and this pair is usually known as the vacuum machine. Its closing weight is about sixteen pounds. By closing the discharge end and coupling the proper nozzle to the inlet end, the operation is reversed and air is blown out under 60 pounds pressure, thus giving the compressed air feature of the system. For portable use the air compressor is mounted on a suitable carriage and the compressed air pipe can then be led to any point several hundreds of feet away (¾ in. pipe sufficient) and the vacuum machine or compressed air nozzle attached.

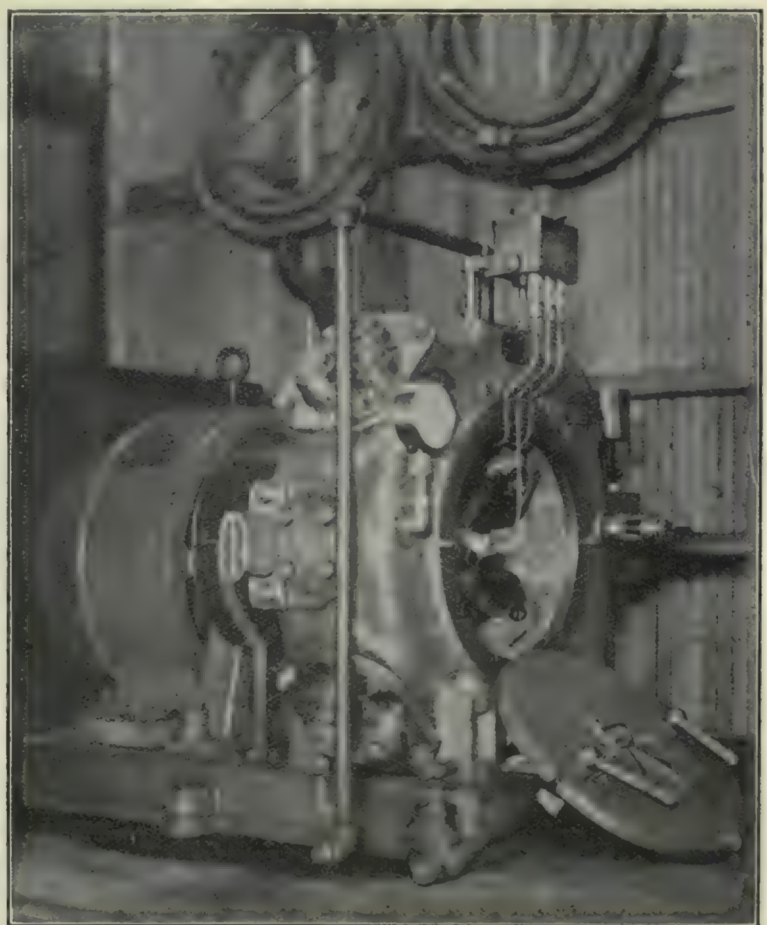
Record of Tests.

The following is a record of air compressor tests made on June 25th by Mr. McRae and Mr. McCabe, of the Toronto Street Railway Co., assisted by Mr. Reavell and Mr. Vandeleur, representing the makers of the compressor. The following gentlemen were present: C. H. Sweetlove, foreman electrical department; Chas. Deacon, foreman machine department; H. McCarthy, assistant inspector of compressors.

Description.

The compressor is one of Reavell's single-stage, water-jacketed type, designed to deliver 60 cubic feet of free air per minute and for a working pressure up to 100 lbs. per square inch. It is driven through rawhide gearing by a Laurence Scott motor, coupled on the same bed plate. The compressor is installed on a wagon, arranged to run on the street railway system, and the wagon is also fitted with necessary electrical equipment and an air receiver piped up to the compressor.

The motor was designed to run on 500 volts, giving a compressor speed of 300 r.p.m. At the car barn where the test was made, however, the voltage was 600, instead of 500, thus increasing the speed of the compressor and also its capacity. Three tests were made, the first to determine the speed of the compressor in the increased voltage; the second to determine the mechanical efficiency, and the third to determine the volumetric efficiency.



Motor and Air Compressor Set for Cleaning Cars—Toronto Street Railway.

Test 1.

The compressor was run on the line voltage of 600 volts, and the speed of the motor taken. This was found to be 930 r.p.m. The designed speed of the

motor at 500 volts was 850 r.p.m. The normal speed of the compressor being 300 r.p.m., its actual speed during the time of the test was:

$$\frac{300 \times 930}{850} = 328 \text{ r.p.m.}$$

It is now required to find what the capacity of the compressor would be under these conditions. The piston displacement capacity of the machine at its normal speed is 66 cubic feet per minute. The increased capacity, due to the increased speed, will then be

$$\frac{66 \times 328}{300} = 72 \text{ cu. ft. displacement.}$$

Test 2.

A test was made now to ascertain the mechanical efficiency of the system. The compressor was run with the air blowing off at 80 lbs. pressure, when the electrical readings were as follows:

Voltage, 600 Amperes, 17 Resulting kilowatts, 10.2	Resulting electrical h.p., 13.7.

The electrical input into the motor was, therefore, 13.7.

It is now required to determine the work done in horse power in compressing the air. The following formula was used:

$$\frac{C \times 144 \times P}{33000} = \text{H.P.}$$

In this formula "C" signifies the displacement capacity of the compressor in cubic feet per minute, i.e., 72. "144" signifies the number of square inches in a square foot. "P" equals the mean effective pressure against the piston of the machine. This could not readily be obtained by indicator diagrams and consequently the average figure assumed by makers of standard compressors for the mean effective pressure due to 80 lbs. delivery pressure was taken. For authority see Hiscox's book on "Compressed Air," page 142, table 18. The mean effective pressure there taken is that based on the pressure being able to absorb four-tenths of the heat of compression, which is the average figure obtained in straight line machines. This means effective pressure for 80 lbs., working pressure is 37.28 lbs. The formula, therefore, appears as follows:

$$\frac{72 \times 144 \times 37.28}{33000} = 11.7 \text{ indicated h.p}$$

The test, therefore, showed that with an input in electrical energy of 13.7 h.p., the compressor was actually giving an indicated horse-power of 11.7 in the air which it delivered. The efficiency, therefore, would be,

$$\frac{11.7 \times 100}{13.7} = 85.5 \text{ per cent.}$$

In other words, the only losses in the machine were $14\frac{1}{2}$ per cent., representing the combined losses of the motor, the gearing and the mechanical losses in the compressor. The rest of the energy put into the machine appeared as indicated horse-power on the air delivered.

Test 3.

This test was directed to finally determine the volumetric efficiency of the compressor. The air receiver of the truck was two feet internal diameter by six feet long, its cubic capacity, therefore, would be $3.1416 \times 6 = 18.8496$, or say, 18.85 cubic feet.

The equivalent free air capacity to fill that air receiver at 90 lbs. pressure would be,

$$\frac{18.85 \times 80}{15} = 100 \text{ cubic feet.}$$

As the compressor at its full speed was 72 cubic feet, the time required, assuming 100 per cent. efficiency, would be one minute 24 seconds to fill the receiver. A test was taken to fill the air receiver from atmospheric pressure at 80 lbs. per square inch, and to ascertain the time actually required. The time was taken when at the instant the motor was started and it was found that the machine took exactly one minute twenty-six seconds to fill the receiver, to a gauge of 80 lbs. per square inch.

The volumetric efficiency, therefore, was represented by the ratio of 84.86, or expressed in percentage would be,

$$\frac{100 \times 84}{86} = 97\frac{1}{2} \text{ per cent.}$$

The water jacketing of the compressor was most efficient, as the air leaving the compressor to enter the receiver was just a comfortable temperature to the hand, as far as could be judged by the delivery pipe; no thermometer temperature, however, could be taken.

COLLINGWOOD'S SHIPBUILDING INDUSTRY.

By W. M. Brown, C.E.

Collingwood shipbuilding yards have for years been the scene of activity. The yard is fitted with the most recent types of ship machinery for the execution of all kinds of construction work.

On the northwest side there is a large building which contains the machinery for preparing the plates, while upstairs is the pattern shop, where a number of men are employed making patterns for vessels upon the stocks, or which may be under contract. At the north side is the building for the wood-working machinery, and which contains the latest improved planers for preparing the timber parts of the vessels. The large foundry, built of brick, is on the south side of the yard. The molding shop, where all kinds of castings are made for vessel construction, is at the east end of the building, and fitted with a large cupola.

The machine shop is at the west end of the yards, and which has all kinds of modern machinery for the thorough execution of the work. Another large building at the west end is the boiler shop. Here not only are made the boilers for the vessels they build, but many others, which are shipped to various parts of the country. At their busy time, the shipbuilding company give employment to about seven hundred men, including all departments. The machinery and plant equipment of the establishment represent the expenditure of about six hundred thousand dollars.

In connection with the shipbuilding it will be interesting to note a few details regarding the harbor and docks. Some years ago the Dominion Government entered into a contract for deepening the channel in this port, which has now, since its completion given sufficient depth of water to float the largest vessels that ply upon the Great Lakes. This channel has been constructed about one and a quarter miles long, and two hundred and twenty-five feet wide, with a depth of twenty-one feet of water, and having its outer end in the deep waters of the Nottawasaga Bay. The direction it takes is to the south for more than half its length, and then it has a gradual curve towards the east to the elevator and Grand Trunk wharves, the new cement dock and the dry dock. There is a basin about 600 feet wide within the harbor, and greater possibilities may yet be developed. There is also a basin which covers about 60 acres, and which may yet be adopted for shipping purposes, in that part of the harbor which extends to the west of the deep-water channel. The bottom of this basin consists of a soft, white clay to a depth of about 21 feet, underlaid by a shoal, so that there would not be much difficulty experienced in dredging to a sufficient depth for heavy-draught vessels.

The dry dock is considered as one of the largest on the lakes, its dimensions from dock sill to cope stone being 524 feet; length on keel block, 515 feet; width of entrance on top, 60 feet; width of entrance on bottom, 54 feet; depth of water over sill, 16 feet; width of dock on top, 78 feet; width on bottom, 60 feet.

There is a new dock now under construction which will be between six hundred and seven hundred feet long, with sixteen feet of water on the sills, and which is expected, when completed, to be one of the largest in the Dominion.

FOUNDRY PRACTICE AND EQUIPMENT

Practical Articles for Canadian Foundrymen and Pattern Makers, and News of Foundrymen's and Allied Associations. Contributions Invited.

MONARCH PORTABLE CORE OVEN.

The core oven illustrated in the accompanying half-tones, is so arranged to be operated with oil or gas, using a Monarch burner, with a very low consumption of fuel. The shelves are arranged to obtain the benefit of the full space and size of the shelf for baking. With this construction, the contents are heated uniformly from top to bottom, the flame being so regulated inside to give this effect. The oven is arranged with two vents, is lined inside with sheet asbestos and can be constructed in any size desired.

In Fig. 1 all of the drawers are shown removed or drawn forward. It will be noted that at the back of each shelf there is a sheet-iron shutter which closes the opening in the front of the furnace when the shelf is drawn forward, so that when one or more shelves are drawn out for receiving or discharging cores, the heat in the oven is prevented from escaping by the shield at the back of the shelf.

In Fig. 2 the oven is shown with one shelf drawn forward, but the construction makes it possible to draw out as many shelves at a time as it may be desired.

The oven will take care of all classes

Fig. 1.—Monarch Core Oven With All Trays Drawn Forward.

of foundry work and will be built to a larger scale, if desired. Though designed for oil, it can be built to use coal or coke. The core oven is neat and compact, the one illustrated being 2x3x6 ft. They are built by the Monarch Engineering & Mfg. Co., 1200 American Bldg., Baltimore, Md.,

Fig. 2.—Monarch Core-Oven With One Tray Drawn Forward.

U.S.A., who are placing them on both the United States and Canadian markets.

MODERN CUPOLA PRACTICE*.

By John C. Knoeppel, Buffalo, N.Y.

When we look about and see the progress that has been made in our industry of recent years, we have reason to congratulate ourselves. The fact however, remains that our old friend "The Cupola" has not come in for as much attention in proportion, as have the other lines.

Foundry owners frequently wonder why they are having trouble with their iron, blaming almost everything but their management of the cupola. This has not received the attention that it should, and as a usual thing the cupola is considered fool-proof, in fact is expected to run itself. Good work with the cupola is first of all dependent upon a thorough knowledge of the cupola and its performance while working under the blast. The construction must next be such that the proper amount of air can actually get in, and in such a way that the temperature conditions are as uniform as possible, so that cold spots are avoided. The tuyere area must be of such a size and so arranged that the blast enters the cupola without undue friction.

The ultimate shape of the cupola lining, if allowed to take its own course, will be found to be slightly built out above the tuyeres, and this is an argument that if left that way, it is most desirable for efficient work. Hence in chipping the cupola and daubing up, it were best left so that only the refuse matter and iron above the tuyeres is taken away, but that this natural shape is left intact. The daubing can be very light, and cracks filled with small broken fire brick or flat brick, as the condition may require it. As the heat at this point becomes very intense, there is a tendency for the daubing to crack off long before melting is in progress. This material falls into the stock and retards melting afterwards.

Bottom is put in so that the surface while dipping from back and sides to the spout, does not fall too steep, as the melted material will run downward with too much force causing trouble in tapping during the heat. It should be so made that the iron will lie quietly on it, and not injure or break through it. The necessary shavings and kindling are now put in, the latter being laid by a man in such a way that when burning it will do so evenly, and without injury to the bottom. Coke is now thrown in and allowed to burn through evenly. When up to proper height as indicated by a wire gauge or other suitable method, charging may begin.

Charging should commence at least two hours before the blast is put on, so that the stock may become well heated through, and the time for lighting up should be arranged accordingly. There should be neither too much or too little coke on the bed. Oftentimes the cupola man is allowed to take all he wants, and the result is a prolonged heat, with dull iron instead of the expected hot material. The iron charged should be of medium size, especially in small diameter cupolas. There should not be too many openings for the free passage or rather escape of the blast. In large cupolas while the stock can be larger, it should not be charged in too compact a way, thus retarding the blast.

The amount of the bed of fuel for a

*From a paper read before American Foundrymen's Association.

cupola is determined by a number of factors. The diameter inside the lining, the height of the tuyeres, blast pressure, class of work, etc. For light work, with practically continuous melting and pouring, the tuyeres should be set low, thus saving fuel for the bed. The bed should extend from 20 inches to 24 inches above the top of the tuyeres, whether one or two sets are used—above the top of the upper if the latter. On the other hand, the tuyeres must not be set too low, otherwise if any iron is to be held, it will be chilled if remaining in too long. From 12 to 16 inches from the bottom plate to the bottom of the tuyeres would seem about right for ordinary practice, the bottom being from 4 to 6 inches thick.

Slagging when the tuyeres are very low often does more harm than good, it retards melting and is destructive to the cupola lining. If the heats are heavy, so that slagging must be resorted to, it is better to put the tuyeres up higher in the first place. The slag hole should not be opened until the slag is high enough to reach it, usually ten tons or so of metal will have passed out by that time.

In large cupolas for medium heavy work, the tuyeres are usually set from 18 to 24 inches from the bottom. The higher they are set, the more fuel is required for the bed. More air must be forced through or else melting is unduly slow. High melting zones and blast pressures have a tendency to harden the iron, make more slag, and give trouble generally.

The charges of iron should be uniform, the first being as large as the last. While undoubtedly more iron could be carried on the first charge, it would mean lowering the bed unduly with subsequent trouble, as the coke charge coming down will not restore the bed to its full height again. It is the best kind of practice to maintain the bed at its proper height at all times, and this can only be done by small and equal charges of metal and the proper proportion of coke between them.

In long heats of high tonnage, it is oftentimes a good practice to help build up the bed by adding additional coke at intervals. Experience will show this best. The writer has always had better results with such small charges. The melting was more uniform and more rapid, with hotter and better iron. With heavy charges, the melting difficulties result in giving metal with compositions different from the expected, and the chemist gets the blame which really belongs to the foundry manager.

The construction of the cupola should be such that the air entering has great volume at low pressure rather than vice versa. Good lining material should be used, preferably double up to the charging door, and single from there upward. The clay-wash should be mixed a day previous to use, and the addition of a little salt helps to tighten the joints. Space is left between the lining and the shell—about half an inch —and this filled up with a grout of old fire brick ground up, and clay. The lining at the melting zone, as stated previously is allowed to take its own shape during the heats, being originally straight like the rest of the construction. If this is done the melting capacity will be found increased. While this is the experience of the writer, he does not wish to be understood as advocating a contracted hearth construction.

The tuyere arrangement is also not considered as it should be. On one occasion the superintendent of a large foundry stated that he had cut out all the so-called fancy tuyeres and put in what he called a "cheese-box." In the course of conversation it crept out that he was having some trouble with his iron, as in some cases he lost 60 points of silicon. His cheese-box, combined with a heavy blast pressure, doubtless was to blame. Another prominent blast furnace man complains that many a foundryman blows the life out of his metal in the cupola.

An experience that once happened to the writer may be of interest in this connection. An accident which took a long time to correct disabled the blower and the cupola had to be banked when in its full charged condition. It was nineteen hours before the blast was put on again, but the heat went out all right. On another occasion one of the cylinders of the engine running the blower blew out, and the cupola heat was taken off with but 4 to 6 ounces pressure on, the heat being about eight tons. The iron while coming down slower, was hotter and had better life than with the higher blast pressure carried regularly. In another case the writer was called into a foundry where they were getting out 40 tons of metal in six hours with a cupola 60 inches inside the lining. Here he found the coke ratio one to five for the first four charges, and a little better later on. A clear case of waste and consequent bad iron. A reduction in the coke quickly straightened matters out.

Fuel that burns up fast, such as coke, must necessarily be supplied with a sufficient amount of air in quick time. The design of the tuyeres therefore plays an important part in this. The writer has found that a continuous tuyere, of proper design, gives the most uniform distribution to all parts of the cupola furnace. The velocity of the air is reduced, and the best kind of melting obtains. When it is considered that to melt ten tons of iron about 300,000 cu. ft. of air must be admitted into the cupola for that hour, it will be seen that the tuyere conditions must be such that a minimum obstruction shall take place before the blast actually is doing its work in the charges.

The coke below the tuyeres serves simply to hold the iron and support the stock. The temperature is far below that of the iron, and hence every pound thus used, unless for special reasons, is a direct waste. If the iron is held in the cupola too long, the blast strikes over the top and injures it. Hence, while on general principles low tuyeres are advisable, they should not be so much so that the metal is damaged when carrying out the daily practice.

The charging door should be as high as conditions will permit above the bottom, so that the fuel will receive the benefit of the heat otherwise wasted. Ten to fifteen feet is the usual custom, though the distance is often made greater. Where a very high stack and charging door is used, it is sometimes advisable to put in an intermediate door, so that in charging the first part of the heat, the bed is not damaged. Further it allows a more even charging. This intermediate door should be sealed up when the charging has reached that point, and then the upper door is used. The charging floor would naturally have to be constructed accordingly.

In every cupola, under the same conditions, there is a fixed melting zone. Below and above this the metal can not be melted successfully. In either case the metal would be dull and damaged. This zone is determined by the cupola conditions and the volume and pressure of the blast. If the iron comes down within ten minutes of the putting on of the wind, it would indicate that the bed was of proper height. If it takes longer, then the bed was too high. The excess of fuel must be burned away, and in doing this the iron is melted slowly and comes dull instead of very hot. The melting zone is usually a space across the cupola about 4 to 8 inches high. Where the blast is heavy, this is sometimes greater. A double set of tuyeres sends the melting zone up higher than is the case with one row.

Regarding the fuel ratio this much may be said. What is economy in one foundry becomes a waste in another. The high melting ratios published are oftentimes very misleading. For general purposes 7 to 8 lbs. iron to one of fuel is very fair. With the same sized small metal charges, the coke between charges generally works out at 1 to 10. This can often be cut a little on the coke end, if the bed is ample, especially at the end of the heat. As this work should not be left to the ten-

der mercies of the cupola man, it is a good plan to hang up a chart of sufficient size in the charging room, on which every charge is marked plainly, so that it can be followed without difficulty. All stock should be weighed, as even the coke will not run uniform in weight if measured in a basket. This is not with the idea that the fuel should be skimped, but simply to have the conditions in charging as perfect as possible, so that the best results may be expected and obtained.

For twenty years the writer has advocated the use of small charges and as mild a blast as possible, and he is glad to note that others are beginning to agree with him. The question of the tuyeres has been his special study, and he hopes that the system bearing his name may have helped to make the work about the cupola easier and the results surer. The cupola is not merely a vessel into which any old thing can be thrown and good results obtained, but it may be come a money maker or loser just as one pleases. In these days of keen competition, it becomes a problem not only to melt iron properly and economically, but to turn out a product that will give the smallest percentage of scrap castings.

EXPANSION AND CONTRACTION OF METALS FROM A PRACTICAL VIEWPOINT.

By J. H. Hart.

This subject covers practically all branches of mechanics, but perhaps the foundry is the place where the most difficult problems arise. The numerous castings after becoming cool have little hollows and blow-holes and what not.

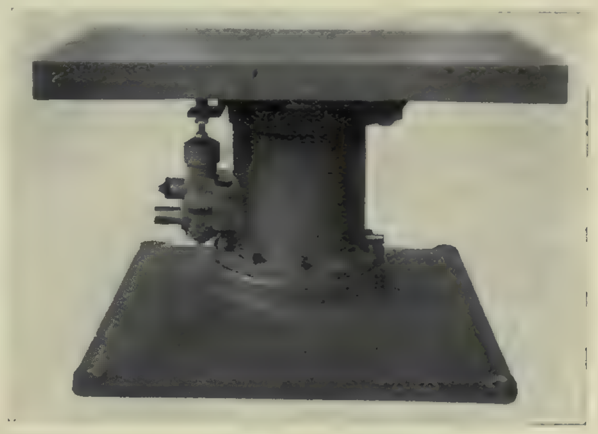
Expension and contraction are universal in nature. Even the plants expand in the hot rays of the summer sun and contract at night when it becomes cool. Even living beings are not exempt from the universal law. And when it comes to the applied arts it is found at its height. This in railroads, houses, bridges, even in musical instruments. All this in the ordinary variation of the year's temperature. How much more in a foundry or shop. The study of this subject is absolutely invaluable to every man who works with metal of whatever description. Losses resulting from ignorance of the simple laws of expansion occur in thousands every day. A man will make a valve of two metals which expand differently and it leaks and proves worthless. An engineer places rails too close together, they expand and press one another outward or upward, and a wreck is caused. Bear in mind though that expansion has its uses, as in the compensating pendulum of a clock, or of the balance wheel of a watch.

Rails are generally in 18 ft. lengths and they should be placed at least 3/8 of an inch apart. In the tropics the distance is increased to fit in with the increased heat.

The design and thickness of a casting are important factors. If one end cools very much quicker than the other, a break occurs. If a piece is very thick and bottom and sides cool before the top, there will be a sink in the top due to accommodation to the size of the rigid part. Generally in metals the shrinkage is proportional to the density. Thus iron with four per cent. carbon will shrink less than iron with three per cent. carbon. Steel, which is a product of iron, will shrink even less. In the mint, why are the coins of gold and silver and copper stamped instead of moulded? Because if poured into a mould, on cooling they would shrink and cause an imperfection either in the roundness or in the design. An explanation of the phenomena of expansion and contraction would seem not to be amiss here. All matter is made up of molecules which at all temperatures are supposed to be in rapid motion. It can certainly be proven that matter is made up of extremely smally bodies with spaces between, for water has been forced through lead and iron. These little bodies as has been said are active at all temperatures, but when an increase of heat is applied they jump around more and through larger distances, thus knocking one another aside more and more, each one hitting his neighbor until we come to the outside ones. As they are the only ones free to move outward without being interfered with, that's just what they do, and consequently we say the metal "expands." We know that no weight has been added to the body, as a hot-body weighs no more than the same body cold. Therefore thus must be the explanation. Now take the breaking of a lamp chimney. One part is accidentally heated more than another part, and those little bodies jump around more until their movements overcome the force of cohesion and the glass breaks. A thin chimney should not beak as easily as a thick one for the thin one is more elastic and can accommodate itself by reason of its elasticity to different shapes.

Castings are made to-day all in one piece which a few years ago were separately cast into three or even more pieces. Just where to put the blame, in the pattern room or the shop is a moot question. If proper care is taken at all times however, the liklihood of imperfect castings is small. Some are lifted from the sand too soon or too late. The former on account of the premature exposure to the atmosphere shrinks on the outside before internal shrinkage has had time to take place, thus condemning the piece to a short life. Castings left too long in the sand become decarbonized, and instead of getting a polished castings with a bright lustre we get a dirty speckled looking article which is often of very little use, that is, if it belongs to the anti-frictional grade of castings.

For metals have various habits under different conditions, and a study of the subject will repay any man working in metals or metalloids of any description.



Osborn Plain Jolt Machine.

PLAIN JOLT MACHINE.

The Osborn Manufacturing Co., Cleveland, are building a line of Plain Jolt Machines that is attracting a great deal of attention. The distinguishing feature of the Plain Jolt Machine is the variation of the length of stroke that may be obtained. This variable length of stroke is controlled by a traveling valve, which is adapted to be set to give any stroke required from 3-16 of an inch to 1½ inches. The ability to change to different lengths of stroke will be found of great advantage in foundries molding a variety of castings, and where there is a variation of the air pressure. This principle of a variable-controlled stroke was first shown in use on this company's

Rockover Jolt Machine, at the Cincinnati convention of American Foundrymen and Manufacturers' Supply Association.

These machines are designed to withstand hard usage and to work accurately. The cylinders are large in diameter. This means great stability and accuracy of stroke.

The Osborn Jolt consumes a small quantity of air per pound lifted. This result is accomplished by the use of an ingenious blocking device in the air chamber. These machines are made with the following lifting capacities:—

1,000, 1,5000, 2,000, 5,000, 10,000, 15,000 and 20,000 lbs.

Coremaking: Logical Beginning of Molder's Trade

The Best Molder also a Good Coremaker—A Short Experiencc of the Apprentice in the Core Department will be of Great use in Future Work.

In recent years the iron molding trade, like all the others, has undergone the changes attendant upon the movement for rapid production. Among the most important developments, or we might call them reforms, is that which made for the improvement of the molders' surroundings; more space in place of crowded shops; better light; better appliances, etc. It is rather astonishing, therefore, in view of all these improvements in the foundry proper, that the improvement in the lot of the coremaker has lagged behind. Perhaps the reason for the inattention from the "powers that be" towards the core department is due to the fact that its production is not salable and generally regarded as a nonproductive expense and as such charged up to profit and loss.

Molders are given helpers to do the unskilled work for them, are allowed the best material and necessary tools to increase their production. What about Mr. Coremaker? "It doesn't make much difference what the quality of material or tools, he will only do so much anyway," so he is permitted to use floor sweepings wet down with a little cheap molasses—as little and as cheap as possible to save expenses. Usually core plates are furnished, but to save the molders' time these are the same size and the coremaker must make the best of it.

Like most adjuncts to any of the trades, coremaking is an evolution depending upon the particular trade to which it is an adjunct, viz., the foundry trade. True it is that the use of cores is as old as the trade itself, and there was a time when a molder considered coremaking a part of his trade. However, improvements both in molding and coremaking have been so rapid and varied that to-day the coremaker has a real value as a specialist and as such has assuredly come to stay. If this be the case then the core maker should receive more consideration instead of being treated with scant courtesy as one having no rights about a foundry worthy of respect. Often the cry comes down from the cost department that "the cores are costing too much" and the screws are put down, say on the quality of raw material (if possible) and on other "ingredients." Molders would have fewer waits for cores if more unskilled help were added to the core room to mix paste, hunt up rods, get sand ready and other routine work that is usually done by the coremaker himself.

A curious fact pertaining to core makers is that no distinction is made to different classes of core makers but a number of molders may work in a foundry, for instance, a heavy work molder, a light work man, or a bench man, while Mr. Coremaker must be the whole shooting match in his department.

Above, it has been stated that coremaking has come to be a speciality, a trade in itself for coremakers alone. Nevertheless, if a molder, when entering his trade looks to the time when he will be in line for a position as foundry manager, he ought to spend at least six months in the core department, and so familiarize himself with the working of this department which is so vital to the rest of the foundry. Some of the very best molders cannot make a core, nor, what is worse, do not know how they are made, because they never had the opportunity to learn or refused to take it if they had.

By making his start in the core room the insight into coremaking that he would acquire, would, in after years enable him to better the conditions and increase the output of the core room, should the power ever come into his hands. If the molder would be a competent foundry manager he must know the fundamental principles of the different branches of the trade, such as tending cupola, melting brass, making cores , ramming dry or green sand, etc.

In beginning work in the core room, one of the most important things to learn is to get the sand mixed the same every day. If careless in this respect the cores will have hardly a crust on them and on other occasions will be all right. Mixing sand should have the same attention and care as mixing iron in the cupola. If too much sharp sand is used the air and moisture will escape too rapidly in the drying process, wherea , if there is too much loam, the core is usually made so light that the outer surface has become hardened before the inside has had a chance to dry. The result of this is the cores swell and crack. If these cracked cores were discarded there would be no harm done but the trouble is that they are used. The unconscientious coremaker generally daubs up the crack and sends the core out and the molder will lose the casting or the machine shop will discover that the metal is too thin to work and scrap the piece. A piece of work may be lost by a molder time and time again and there is not very much said about it, but if the trouble can be traced back to the coremaker—poor fellow! Unfortunately, if the cause of the trouble is carelessness or the molder's fault, he will do his best to blame the coremaker. If the foreman has made cores himself, he would be able to lay the blame at the proper door by examining the castings himself.

ALLOYS AND FLUXES.

A uniform grade of metal with a uniform color, strength and good casting qualities is the desideratum of every brass or bronze founder. The necessity of using up the borings, gates and scrap of previous melts introduces an element of uncertainty into the mix, to overcome which purifiers have to be added and corrections made.

The United States Alloys Co., 1206 American Building, Baltimore, Md., have prepared a series of fluxes and alloys for cleansing the metal of impurities, by converting them into fusible slag, which rises to the surface and can be skimmed off.

After the impurities have been removed and thrown into the slag the corrections may be made. If it is desired to increase the strength of the metal, a little manganese copper may be added in amount up to say 5 per cent. The action of manganese copper is similar to that of phosphorus with the distinction that an over dose of the same does not make the metal brittle like phosphorus would do. Manganese does not combine well with alloys containing more than 2.5 to 3 per cent. of tin.

Silicon-copper is the alloy they recommend for fine castings, thin sheets, rods or ornamental work.

The road to success is none the less worth traveling on because it is not short or easy.

Method Used for Developing Involute Gear Teeth

Involute System Being Most Simple and Serviceable is in More General Use than any Other, Especially where Gears are Interchangeable.

By J. H. R., HAMILTON

If two cylinders A and B, Fig. 1, are kept in contact by pressure exerted on their bearings, as shown at P.P., and one of the cylinders is revolved in the direction of the arrow, the other cylinder will revolve in the opposite direction at a surface speed equal to that of the other, and will make as many revolutions in inverse proportion as the driver. But if slipping occurs the speed of the driven wheel would vary to such an extent that a positive drive could not be depended on.

Therefore, to have a positive drive, teeth must be cut or cast on the edge of the cylinders to prevent the possibility of slipping.

If pieces like p p and grooves like g g, be fastened and cut on the two cylinders, as shown on Fig. 2, slipping would not occur, the number of revolutions would be in inverse proportion to the diameters, the same as in Fig. 1, but the speed at the circumference would vary, as the shape of the teeth would cause an unsteady motion.

Therefore, the teeth must be so designed that the pitch circle or pitch line of the two gear wheels will have the same relative velocity as two cylinders kept in contact and revolving without slipping.

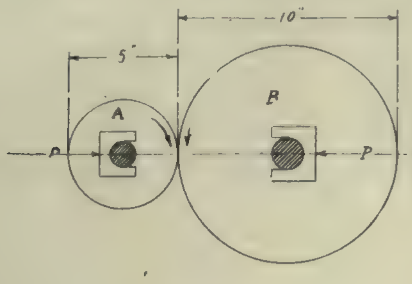


Fig. 1

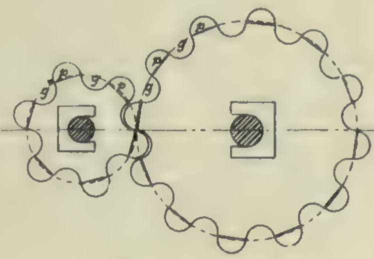


Fig. 2

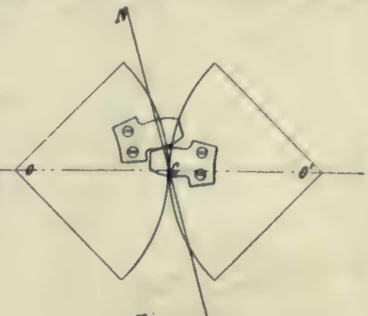


Fig 3

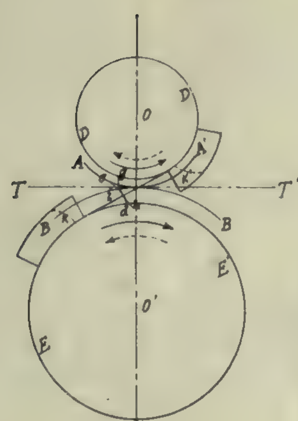


Fig. 4.

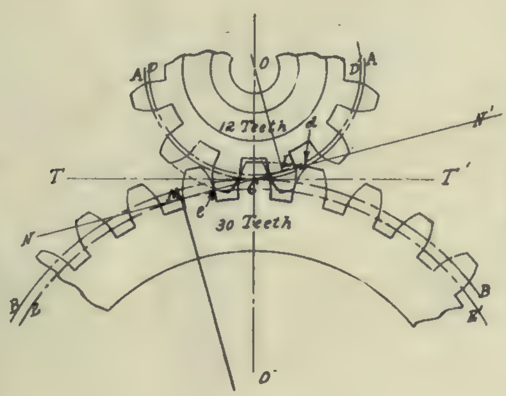


Fig. 5.

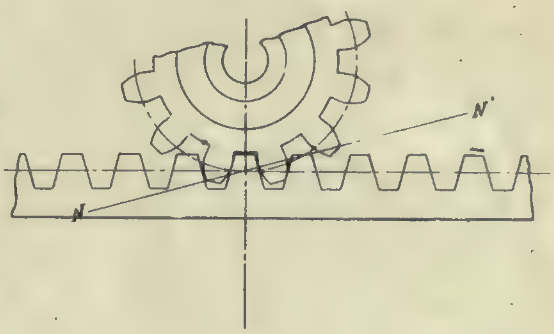


Fig. 6.

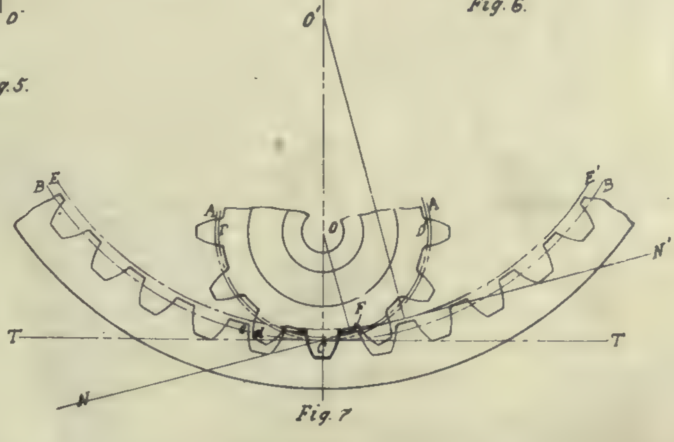


Fig. 7

The pitch point of two gears is the intersection of the line of centres with the pitch circles of the gear, shown at C in Fig. 3.

The point of contact is the point where two teeth touch each other.

To have a uniform motion at the pitch circle of two gears in mesh, the tooth curves must be of such a shape that they will be at right angles to a line NN1, drawn through the pitch point and point of contact, as shown in Fig. 3.

This line is known as the common normal to the tooth curves.

The path of contact is the curve described by the point of contact during the entire action of a pair of teeth. The angle through which a wheel turns during the path of contact is known as the angle of action.

The angle of approach is the angle that the wheel turns between the time the teeth come in contact until the point of contact coincides with the pitch point C. From the point C to the moment that the teeth are no longer in contact the angle is known as the angle of recess. The corresponding arcs of these angles are called the arcs of action, approach and recess.

The arc of action must at least be equal or greater than the pitch, so that one pair of teeth will remain in contact until the next pair begin to act.

Fig 4 shows two cylinders placed a short distance apart and connected by a string wound several times around each cylinder. If one cylinder is revolved, a point on the string connecting the two cylinders will gradually recede from one cylinder and approach the other. Now, if a piece of paper is fastened to the bottom of each cylinder so that it will clear the other one and a pencil inserted in the string at the point where the

string leaves the circle E E1, and the circle D D1 revolved in the direction of the full arrow, the dotted curve K will be drawn on the paper attached to the circle E E1. If the operation is reversed the dotted curve K1 will be drawn on the paper attached to the circle D D1.

Now, if a cut is made along the curves K and K1 and the outer part of the paper removed, the cylinders revolved until the curve K corresponds with the line ed, and the curve K1 corresponds with the line gh, the cord will be at right angles to the both curves K and K1, therefore the curves are suitable for tooth curves, providing the cord passes through the pitch point. To have it do this, through the intersection of the cord and line of centres draws the circles or arcs A A1 and B B1, with O and O1 as radii. These circles would represent the pitch circles of the gears, and the circles D D1 and E E1 would be the base circles.

The angle that the cord makes with the line T T1 is called the angle of obliquity.

Standard Interchangeable Gears.

In standard interchangeable gears, based on the diametral pitch this angle of obliquity is taken at 15 degrees.

Fig 5 shows a pinion of 12 teeth and a gear of 30 teeth (6 pitch) in mesh. The angle of obliquity TCN equals 15 degrees.

The common normal N N1 must pass through the pitch, point C, which is the intersection of the line of centres O O1, and the two-pitch circles AA and BB.

The base circles D D1 and E E1 are found by drawing circles tangent to the line N N1, as shown in Fig. 5.

The curves of the teeth outside of the base circles are involutes, and the flanks from the base line to the root of the teeth are radial lines.

To find whether a pair of involute gears will work well together without interfering at any point during the time of contact, draw the radial lines O L and O1 M perpendicular to the line of action N N1. If the intersection of the addendum circles (shown dotted) and the line N N1 fall between the points L M, as at c, there will be no interference or crowding, but if it falls outside, as at d, the teeth of the gear will interfere.

This objection can be remedied by slightly rounding the corners of the larger gears.

Fig. 6 shows an involute pinion and rack in mesh, the sides of the teeth on the rack are straight lines, making an angle of 15 degrees, with the pitch line or perpendicular to the line of action N N1.

Fig. 7 shows a pinion in mesh with an internal gear. The angle of obliquity TCN equals 15 degrees.

The pitch circles must pass through the pitch point C, and the base circles are drawn tangent to the line of action N N1. If the addendum circle of the internal gear is drawn through the intersection of line of action and perpendicular OF, the teeth of the wheel will have no faces, while the teeth of the pinion will have very little or no flanks. If the pinion is very large in comparison to the gear, the points of the teeth c and d may interfere, which may be avoided by slightly rounding the corners.

Drawing Profiles Graphically.

To draw the profiles of the different shapes of teeth graphically will now be described.

If a circle is rolled without sliding on a straight line a point on the circumference of the circle will describe the cycloid curve.

This circle is known as the generating or describing circle. The manner of drawing the cycloid curve is shown in Fig. 1a. O is the centre of the generating circle, P is the point on the circumference used in generating the curve. A B the straight line on which the circle is rolled, being equal in length to the circumference of the circle.

The generating circle should be placed so that its centre is above the centre of the line AB. Divide the generating circle into any number of equal parts, say twelve, as P, 1, 2, 3, etc., and through these points draw lines parallel to AB. Divide the line AB into the same number of equal parts, as A, 1, 2, 3, etc. Erect perpendicular lines from these points, cutting the line GH at the points 1-1. 2-1, 3-1. etc. With these points as centres and radius of the describing circle draw arcs cutting the horizontal lines at P1. P2. P3, etc. Through these points draw the curve APB, which will be the cycloid curve.

If the above operation is performed on the outside of the circumference of a circle, the point P will generate a curve called the epicycloid curve.

Fig. 2a shows the manner of drawing such a curve, AB is the arc on which the generating circle is rolled, its centre being at S. 6A and 6B each represent one-half of the circumference of the generating circle. Divide the arc A6B and the generating circle into the same number of equal parts, in this case twelve, as P, 1, 2, 3, etc., and A, 1, 2, 3, etc. With S as centre draw arcs through the divisions on the generating circle as C D, EF, GH, etc., and radial lines from the centre S to the line mn, cutting the line mn at 1-1, 2-1, 3-1. etc., with these points as centres and radius of the generating circle, describe arcs cutting the arcs KL, IJ, etc., at P1, P2, P3, P4, etc. Through these points draw the epicycloid curve APB.

The hypocycloid curve is generated in the same manner, only the generating circle is rolled on the inner side of the circumference of the arc AB, instead of on the outside.

The manner of drawing such a curve is shown in the lower half of Fig. 2a, in which the same figures and letters are used as in the upper half.

If a string is wound upon a cylinder and then unwound, keeping the string tight, the end of the string being at P Fig. 3a, the point P will describe what is known as the involute of the circle, or simply the involute. Divide the circle into any number of equal parts in this case twelve, and using one-half as shown. From the divisions draw lines, tangent to the circle, as 1P-1, 2P-2, 3P-3, etc. Make 1P-1 equal in length to the arc 1P, 2P-2 equal in length to the arc 2P, and so on. A curve drawn through the points P, P-1, P-2, P-3, etc., will be the involute of the circle.

Application of Profile Curves.

The uses of these curves in drawing the profiles of gear teeth will now be more clearly shown.

In Fig. 4a is shown the method of drawing the profile of a gear tooth on a spur wheel by the use of the epicycloid and hypocycloid curves, the former being used for the faces of the tooth and the latter for the flanks, and is known as the cycloidal or double curved teeth.

Let AB be an arc of the pitch circle of the gear, and OP equal the radius of the pitch circle. For the diameter of the describing circle use a diameter equal to one-half the diameter of the smallest gear in the set, in this case say $2\frac{1}{2}$ ins. From O draw a straight line cutting the arc AB in P, and produce it. Let SP and S1P each equal the radius of the generating circle.

For the face of the tooth roll the outer describing circle along the arc AB in the direction of the arrow and the point P will describe the curve required for the face of the tooth. For the flank of the tooth, roll the inner describing circle on the inside of the arc AB in the direction of the arrow and the point P will describe the curve required for the flank of the tooth.

Find the different positions of P on the curves of the tooth by the method shown in Fig. 2a.

Make $EF = .3p = .3 \times 1.375 = .4125 =$ the addendum. With OF as radius and O as centre draw the top of the tooth HG. Bisect the arc GP by the line C C1, and with trial centres as 1, 2, 3, etc., find a radius that will correspond as near as possible to the curve of the face of the tooth, as OP. With O as centre and a radius of OQ describe a circle, and on this circle will fall the centres of the arcs necessary for the faces of the teeth.

In a similar manner the curve for the flank of the tooth is found by the construction of a portion of the hypocycloid curve, and a radius found by bisecting the curve PG-1, and on this line find a radius that will describe an arc corresponding nearly to the hypocycloid curve. With OQ1 as radius and O as centre describe a circle, and on this circle will fall the centres required to draw the flanks of the teeth. On the pitch circle lay off PD=width of tooth=.48p=.48× 1.375=.66 inches and from D repeat the operations, only in the opposite direction, or with the radius QP reversed draw the left side profile of the tooth, and with radius Q1P reversed draw the left side profile of the tooth flank.

It is a usual custom to leave a small fillet in the corner at the root of the teeth, as it makes it stronger and less liable to crack when being cast.

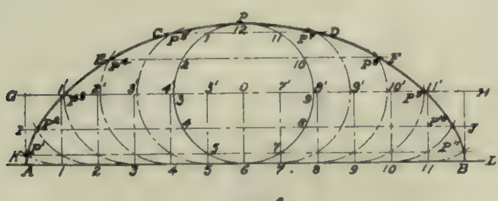


Fig. 1.a

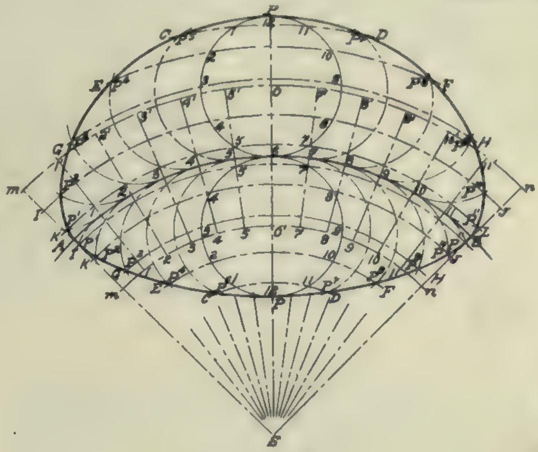


Fig. 2.a

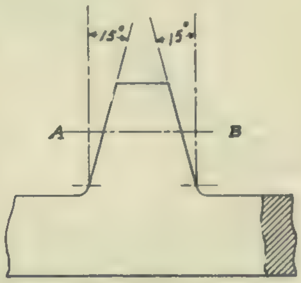


Fig. 7.a

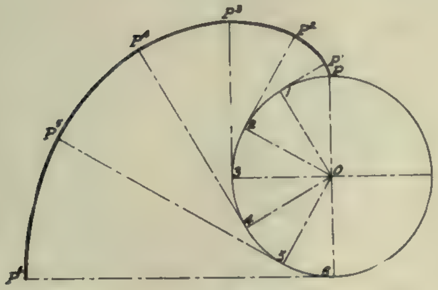


Fig. 3.a

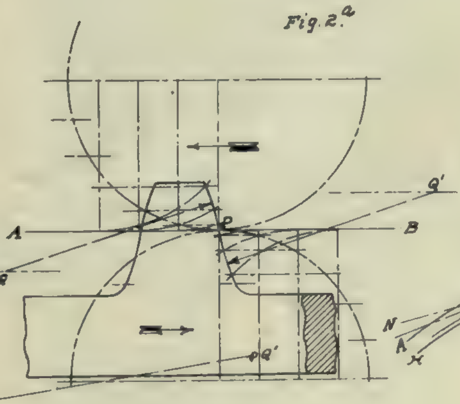


Fig 5.a

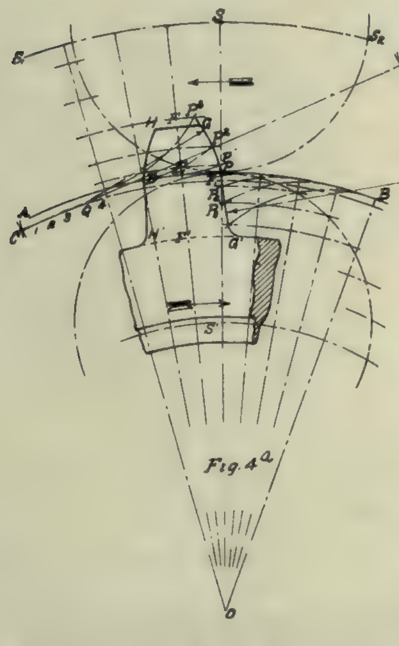


Fig. 4.a

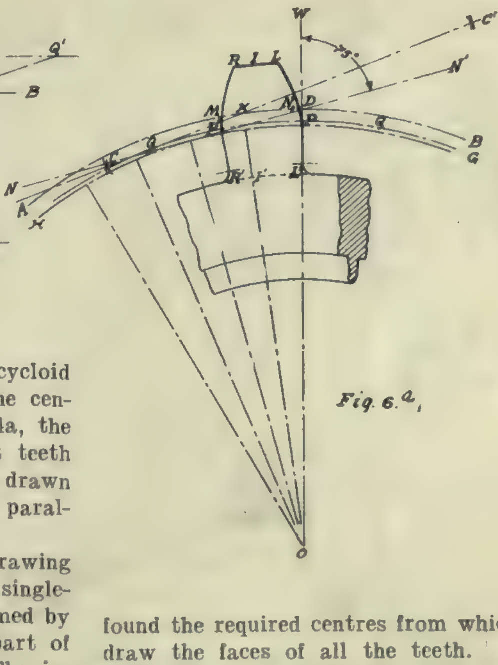


Fig. 6.a

In Fig. 5a is shown the profile of a rack tooth developed by the use of the cycloid curve, shown in Fig. 1a.

The generating circle is revolved or rolled on the upper edge of the pitch line, to form the faces, and the lower edge of the pitch line for the flanks of the teeth. Approximate curves are drawn by finding radii that will correspond as near as possible to the cycloid curves. The method of finding the centres, being the same as in Fig. 4a, the various centres for the different teeth will be found, on a straight line drawn through the points Q and Q1, and parallel with the pitch line AB.

Fig. 6a shows the manner of drawing the profile of the involute or single-curve tooth. The profiles are formed by a portion of an involute and a part of the radius of the pitch circle. The involute is drawn from a circle called the base circle, which is found as follows. Draw an arc of the pitch circle A B and produce a radius O W, cutting the pitch circle at the pitch point D. Through D draw a straight line N N1 at an angle of 75 degrees, with the line OW.

With O as a centre draw an arc of a circle tangent to the line N N1. This circle is the base circle which cuts OW at P. On this circle, using the method shown in Fig. 3a, draw a portion of an involute with OI as radius, equal to one-half the outside diameter of the gear draw the arc RIL, forming the top of the tooth. Bisect the curve PL by the line C C1 and on this line find a centre with radius QP that will draw an arc corresponding as near as possible to the involute curve. This is the approximate method of drawing the faces of the teeth. With O as a centre and OQ as radius draw a circle on which will be found the required centres from which to draw the faces of all the teeth. The flanks PL1 and P1R1 are portions of radial lines drawn from the base circle to the roots of the teeth.

Small fillets are left at the roots of the teeth as shown.

Greater accuracy is obtained when drawing these profiles, by dividing the describing circles and base circles into a greater number of equal parts.

The profile of the involute rack tooth is shown in Fig. 7a, the sides of the teeth making an angle of 15 degrees with a line drawn perpendicular to the pitch line AB.

STARRETT'S NEW TOOLS.

Fig. 1 shows a universal bevel protraction with vernier. The verniers are so placed with relation to the graduated half-circles as to make the protractor readable by vernier in any position. The protractor stock is 4 in. long and has either a 7 or a 12-in. blade, ½-in. wide. With the 7-in. blade the tool weighs but six ounces. The disc is graduated in degrees from 0 to 90 each way and rotates the entire circle on a central stud inside the case. The blade, clamped by an eccentric stud against the edge of the disc, may be slipped back and forth its full length, or turned at any angle around the circle and firmly clamped at any point. The figures on the vernier are placed close to the lines, thus making it easy to read the tool when taking measurements. There is a central locking nut on this protractor. By a slight turn of this nut the protractor is firmly held in position.

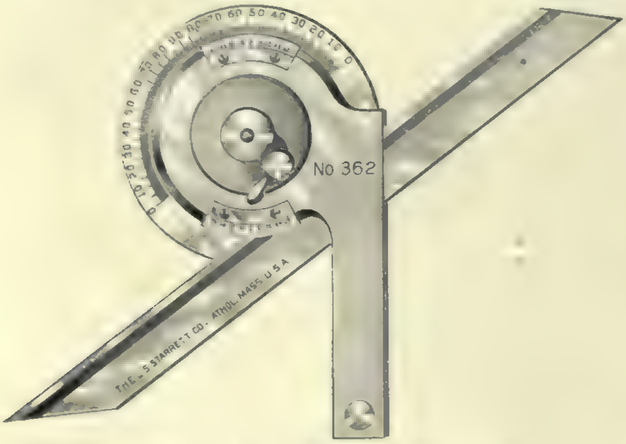
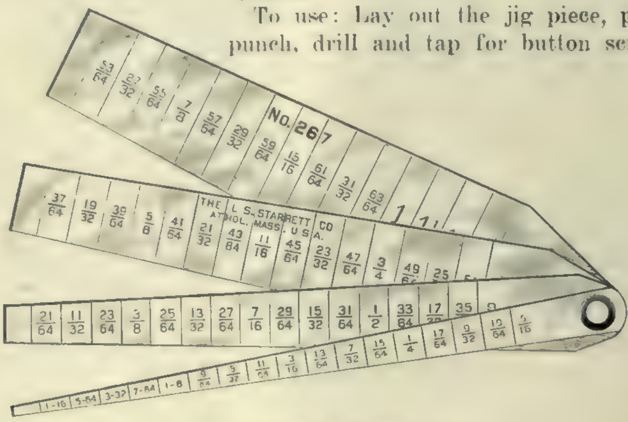


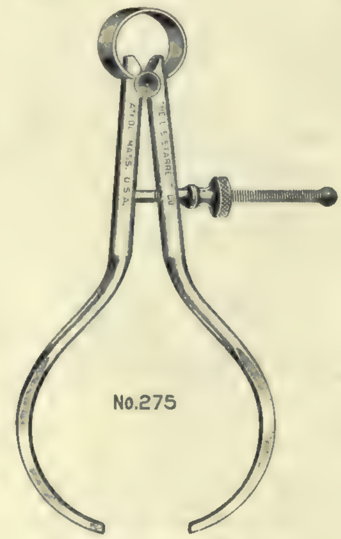
Fig. 1.—Universal Bevel Protractor With Vernier.

The level sight attachments, Fig. 2, are made to slip on and off the top side of iron levels and are held in place by set screws. They have hight holes—one with a cross wire of line accurately from top of and parallel with level. Sighting through the holes will enable one to use the common level for leveling a plot of ground from a fixed point at long range.

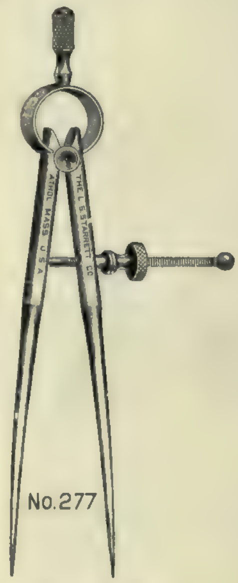


Starrett's New Taper Gage.

Fig. 3.—Toolmaker's Buttons with Screws and Washers for Jig Work.



Starrett's Inside Dividers.



Starrett's Dividers.

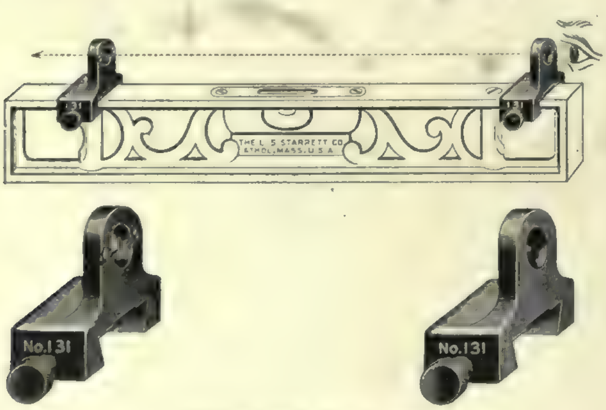
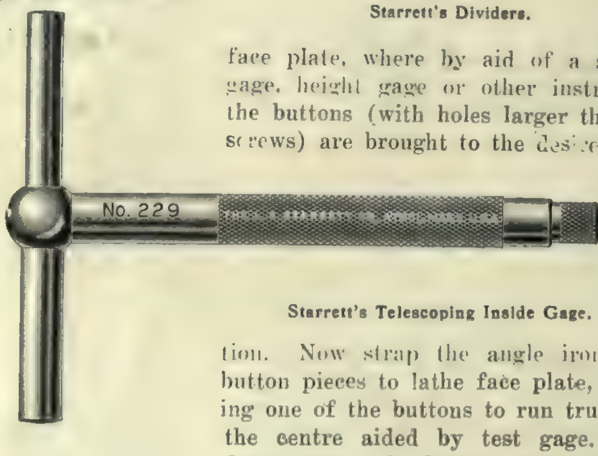


Fig. 2.—Level Sight Attachments.

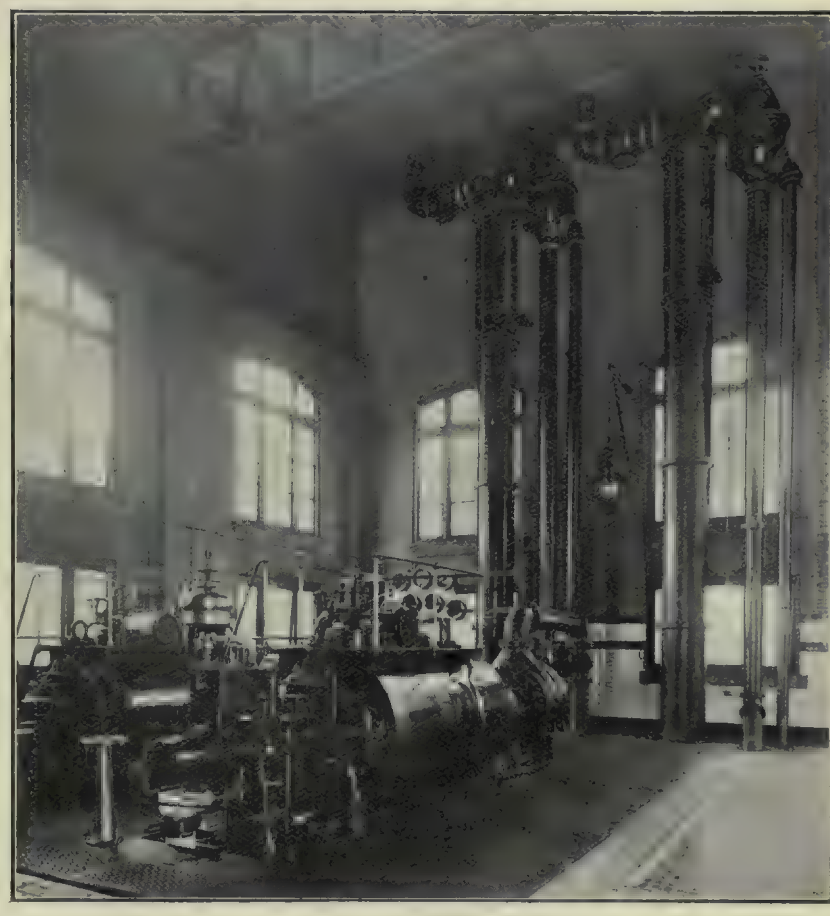
Fig. 3 shows tool-makers' buttons with screws and washers for jig work. These buttons are hardened and ground to standard size, .400x1-2 in. and are used to locate holes to be chucked and bushed for jigs where positive accuracy is required.

To use: Lay out the jig piece, prick punch, drill and tap for button screws and smooth off burr raised by tapping. Fasten on the buttons, strap the pieces to an angle iron, place same on a surface plate, where by aid of a surface gage, height gage or other instrument the buttons (with holes larger than the screws) are brought to the desired location. Now strap the angle iron with button pieces to lathe face plate, bringing one of the buttons to run true with the centre aided by test gage. This done, remove the button and chuck and ream the hole. Repeat the operation with the other buttons until all the holes are chucked.



Starrett's Telescoping Inside Gage.

Miniature of Winnipeg Power Development scheme. This was shown at the Industrial Exhibition, Winnipeg, and at the Canadian National Exhibition, Toronto.



Toronto has been instaling some large pumping machinery. The accompanying illustration shows two Westinghouse-Parsons turbines, direct connected to two centrifugal pumps, operated with Worthington Barometrie Condensers, in the John Street pumping station. The capacity of each unit is five million gallons in twenty-four hours.

The Great Falls Power Co. is contemplating a power transmission scheme in Manitoba, which will be equalled in Canada only by the Ontario Government's power scheme.

INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News.

Foundry and Machine Shop.

The Ontario Bennett Tunnel Machine Co., Galt, have obtained a charter.

The Caledonia Foundry, Ottawa, was partially burned on Sept. 3. The loss amounted to $2,000.

The proposed iron and steel enterprise at Vancouver, represents an investment of nearly $3,000,000.

The work of the new repair shops of the Waterloo Mfg. Co., at Portage la Prairie, is now nearing completion.

The G.T.R. have removed their shops from East Toronto, and repair work in future will be done at Mimico, Stratford and Belleville.

The work of constructing the $75,000 machine shop and 44 stall round house for the G.T.P. at Edmonton has commenced. Work will not be completed for two years.

The Electrical Products Co., of which Fitzgerald & Bennie, Niagara Falls, N.Y., are the principal owners, will locate a factory at Chippewa. Building operatiosns will commence at once.

The plant of the Canada Brass Foundry Co., Toronto, which has been idle for some years past is to be reopened within the next few weeks. The business will hereafter be known as the Ontario Brass Co.

For the reported sum of $350,000 the Albion iron works property at Vancouver has been sold to a railway company, the identity of which real estate men can only guess at in the absence of an authoritative statement.

A. E. Hamilton, St. John, has been awarded the contract for the new I.C.R. repair shops to be built near the Gilbert's Island round house. A large building with corrugated iron roof will be erected and Mr. Hamilton is arranging to begin work at once.

The Hamilton Foundry Co., Hamilton, have under construction a foundry 57 x 82 ft. at the corner of Ruth and Clinton Sts., Hamilton, which will be equipped for general foundry work. A cupola of six tons capacity has been installed and other equipment will be added as required.

The Malleable Iron Works, in Amherst, N.S., which suspended operations about eighteen months ago, have been taken over by the Rhodes-Curry Co., and will resume active work at once. The Malleable Iron Co., when re-opened, will give employment to about one hundred men.

The Martin Mfg. Co., Whitby, has purchased the foundry premises lately occupied by the Farmers' Co-operative Harvesting Machine Co., now being wound up. The company has in view the manufacture of the cloth used in horse blankets, also the felt required in the harness trade.

Gordon Laws' machine shop, Ottawa, known as the Caledonia Foundry was damaged by fire on September 3. The loss amounted to about $3,000 and affected the pattern shop where a great many patterns were destroyed. The firm was very busy at the time, having several weeks' work ahead, but every effort was made to cope with all business in spite of the unfortunate hindrance.

The Dominion Bessemer Mines Co. is commencing operations on an extensive scale on the iron properties at the head of Thunder Bay, twenty-two miles from Port Arthur. The company is building docks, and it is expected that shipments will be made next season by boat direct from the properties. It is believed the St. Anthony mine in the Sturgeon Lake district will reopen shortly.

The open-hearth furnaces of the Nova Scotia Steel & Coal Co., at Sydney Mines, after being closed for re-lining and repairs, has resumed at full blast. It is understood that they will commence operations by turning out steel for the Dominion Iron & Steel Co., the inference being that the demand for the finished product of the latter is so active as to exhaust their capacity in the matter of raw material.

The Doty Engine Works, Goderich, have recently completed a number of additions and improvements to their plant. Two new workshops have been completed, and the installation of machinery is now in progress. When the work is completed, the floor space of this factory will have been quadrupled over what it was a few months ago. The company has a large number of orders in hand, particularly for the west.

The Edge Tool Works at Galt will be reopened. The new manager of the firm is Allan Hills, a Britisher of wide experience in this line. In addition to having considerable finances himself, it is understood that Mr. Hills has unlimited British capital behind him. A gang of men is now at work preparing the factory for re-opening and it will shortly be running full blast. In the neighborhood of one hundred hands will be employed and the factory will turn out immense quantities of edge tools, hammers and other articles.

Brantford has secured another industry through the newly-formed publicity and industrial department. The Brantford Steel Range Company has been organized, with a capital of $40,000, the applicants being John Muir, W. D. Schultz, J. H. Ham, E. L. Goold, J. H. Sanderson, W. H. Wilkes, W. Stanford, F. W. Ryerson, P. Verity, and W. T. Henderson. Temporary quarters have been secured, but as the industry develops, a move will be made to larger quarters. The product will be a cooking stove, of which W. Stanford is the patentee. It is very economical of fuel, and so arranged that meat can be cooked in one oven, and cakes or such in the other.

Municipal Enterprises.

A modern waterworks plant to cost over $20,000 is proposed for Fernie, B.C.

About $90,000 is needed to complete Markdale's, Ont., waterworks system.

A by-law will be introduced to raise $275,000 for waterworks purposes at Richmond, B.C.

The ratepayers of Cranbrook, B.C., will take over the waterworks system at a cost of $40,000.

A by-law authorizing the borrowing of $115,000 for civic purposes has been ratified at Hull, Que.

Waterworks extension, costing in the vicinity of $11,000, will be commenced at Portage la Prairie at once.

Exeter, Ont., ratepayers have approved of a by-law to raise $22,000 to instal a waterworks system.

Yorkton, Sask., ratepayers recently voted in favor of a by-law to raise $20,000 for waterworks extensions.

The Canada Iron Corporation, of Montreal, has been awarded the contract for 1,942 tons of cast iron pipe at $40 per ton, and specials $65 per ton, all f.o.b. cars Regina.

The town council of Taber, Alta., are asking the ratepayers to support a by-law to raise $55,000 by 20-year debentures for the purpose of the erection and construction of a stand-pipe, water mains and hydrants.

The London Water Commissioners have selected a site for the combined water and power station. The council have finally passed the water by-law to expend $123,700 for the artesian wells, pumping and power distribution plants on Horton Street, effecting a saving estimated at $4,000 per annum.

The Clinton, Ont., waterworks committee have awarded contracts for waterworks as follows: Pipe laying, T. M. Cullen, Huntsville, prices ranging from 18c to 30c per foot; cast iron pipes and special castings, Gartshore, Thompson Co., Hamilton, $32.20 per ton; construction of 80-foot stand-pipe and foundation, Hunter Bridge & Boiler Co., Kincardine, $5,000.

The construction at Winnipeg of a 5-mile pipe line from the Red river, to provide a sufficient quantity of water for the great shops being erected for the G.T.P., in Springfield, has been decided upon. Tenders for this pipe will be called for shortly. A pumping station will be erected, capable of forcing the water through the main at high pressure, and in connection with the large reservoir to be erected at the shops, there will be a settling basin.

Contracts for part of Orillia's new waterworks system amounting to $34,109 have been awarded to J. A. McIlwraith, Collingwood, for sanitary sewers at $11,815; T. Clement, Orillia, receiving basin and pumping house, $6,175; Canada Foundry Co., force mains, $8,125; Jno. McDougall & Co., Montreal, for machinery, including two large centrifugal pumps, 30 h.p. motor, switch board, all electric equipment, gasoline engine, setting and installing machinery and all expenses in connection with operating for two weeks, $4,166.

Contracts for the new waterworks and sewer system at Cobalt have been awarded as follows: Contract "A," supplying cast iron pipe and special castings, Canada Foundry Co., $7,842.40; contract "C," supplying steel stand-pipe, Canada Foundry Co., $2,540; contract "D," supplying vitrified tile pipe and junction, Toronto Sewer Pipe Co., $1,800; contract "E," cast iron manhole covers, London Foundry Co., $526.50; contract "F," labor and certain materials, William Newman & Co., Winnipeg, $38,584.10. Contracts "B" and "G" for supplying hydrants and valves, and for supplying and erecting pumping machinery, were not awarded.

Railway Construction.

It is announced that construction on the new Transcontinental terminals at Sillery, Que., will be commenced shortly.

The contract for the laying of fifty miles of track on the G.T.R. branch from Tofield to Calgary has been sublet to Geo. H. Webster. Work will begin at once.

In exchange for giving the Great Northern Ry. 61 acres of tideflats the railway will expend about $3,500,000 on its False creek terminals near Vancouver.

The Rainy River Radial Railroad Co. is seeking a charter to build several electric car lines between Fort Frances and the American boundary, near International Falls.

The International Electric Railway Co. will soon commence the construction of its proposed electric railway from a point in the municipality of Surrey to a point at or near Port Kells, B.C.

The British Columbia Electric Railway Co. has just let the contract for constructing four miles of single track lines in South Vancouver to Christian, Hartney & Christian. Operations will begin immediately and the lines are to be completed well before the end of the year.

The Grand Trunk Pacific has awarded to Foley, Welch & Stewart a new contract for the second section east of Prince Rupert. It will be 140 miles from Copper river, east to Aldermere. This leaves a gap of less than 500 miles, and contracts for this may be let before the end of the year. The new contract was for approximately $10,000,000. There are several long tunnels, one half a mile in length.

Electrical Notes.

The Brantford Street Railway Co. will erect a power house in West Brantford.

The Cranbrook Electric Light Co. have decided to put in a new steam plant at a cost of $30,000 to $50,000.

Arrangements are being made by the Durham-Northumberland Power Co. for the development of extensive water power in the vicinity of Port Hope.

A company headed by Walter U. Homfray has been formed at Kamloops and has secured water rights on Louis creek. The company will be known as the North Thompson Power and Development Co.

Renfrew council will develop the water power which it recently purchased for $7,000, and has engaged John B. McRae, of Ottawa, as engineer. The town wants electric power for the operation of waterworks machinery and the lighting of the streets.

That there is at the very least ten thousand horse power in the river Saskatchewan awaiting development, and that the energy can be developed at a comparatively reasonable cost is the statement made by Engineer C. H. Mitchell, Toronto, who has been down at La Colle Rapids laying out the plans for the proposed Prince Albert plant.

The by-law ratifying the agreement with the B.C.E.R. Co., under which Victoria agrees not to enter the power business without first offering to buy the company's plant, was carried by 150 votes over the three-fifths necessary of the total vote cast. The company in return

agrees to spend $1,500,000 in installing a power plant at Jordan river.

The B.C. Electric Railway Co. are to commence work at once on the Jordan River power project, the company's engineer being already in town in connection with this work. The first unit of power will be ready in about one year, the remainder of the work will take about another two years to complete. The whole work will cost close to $2,000,000.

A new company known as the Ridgeville Electric Light & Power Co., has been recently formed. Capital $40,000. Incorporators, George Arnold, Ridgeville; H. A. Rose and F. W. Houston, Welland; J. C. Stoat, Fenwick, and H. S. Arnold, Toronto. The object is to supply electric light and power to places in the townships of Thorold, Pelham and Gainsboro.

The Commissioners of Queen Victoria Niagara Falls Park have given permission to the Ontario Power Co., to spend over a million dollars in laying another pipe from the gatehouse to the power house. The new pipe is to be the same diameter as the old, eighteen feet, but instead of being steel encased in concrete, will be wholly of reinforced concrete. It is anticipated that the work will be completed in six months.

Work has been commenced on the erection of the power station, dams, etc., of the Calgary Power & Transmission Co., at Bow River, 45 miles from Calgary. 3,000 h.p. have already been contracted for with the Western Canada Cement & Coal Co., Exshaw. Smith, Kerry & Chace, engineers for the company, have awarded the contract for two 2,000 k.w. generators of the 300 r.p.m. waterwheel type to the Canadian General Electric Co., of Toronto. The balance of the tenders will be shortly awarded.

The report of the gas and electric inspection branch of the Inland Revenue Department for the last fiscal year shows that 359,283,286 kilowatt hours were generated for export from Canada, as compared with 135,079,688 kilowatt hours for home consumption. The Canadian Niagara Power Company exported 221,927,240 units and produced 5,405,760 units for home consumption. The figures for other companies are as follows: Electrical Development, home consumption, 85,515,480 units; export, 4,680,500 units. Ontario Power Company, home consumption, 44,150,580 units; export, 131,833,782 units.

The following contracts for the Ontario hydro-electric line construction material have been awarded: Bissell Company, 1,200 thirty foot six inch top poles for $2,640; 1,200 thirty foot, seven inch top, poles for $3,600; 300 forty foot seven inch top, poles for $1,710; 300 fifty foot, seven inch top, poles for $3,150; 2,000 four-pine crossarms at $510; 2,500 six-pin crossarms at $737.50. London Bolt & Hinge Works, 9,000 braces, ¼ by 1½ braces for $423.90; bolts, screws, and washers, $317.88. Northern Electric Company, 20,000 locust pins for $320. The Locke Insulator Manufacturing Company, 20,000 deep groove double porcelain insulators for $640. The Wire & Cable Company, Montreal, 53,000 pounds solid "T.B." weatherproof wire and 5,000 lbs. weatherproof wire at $9,292.

No less than three companies, millions of dollars, and at least two thousand men, are concerned in the competition to be first in the camp with the energy to drive Cobalt's drills and operate her hoists and pumps. The great factor in the development of Cobalt, the Montreal River, will supply the power for all three companies. The Cobalt Hydraulic, a New York concern, with considerable La Rose and Nipissing capital behind them, now have their millions of pounds of steel tubes,, twenty inches in diameter, all imported from Germany, laid and connected up, and they are busy completing their power plant at Ragged Chutes. They are going to supply compressed air only. It will be the largest compressed air plant in the world. The Mines Power Co. started later in the race than the Cobalt Hydraulic, but they have infused any amount of energy into their operations, and are even now building sub-stations at Cobalt and Kerr Lake to accommodate the enormous air compressors and electric transformers. The Beach Bros. are generating power at Hounds Chutes, and though their undertaking is not on the immense scale of the two other companies, it is further advanced.

Structural Steel.

The Saskatoon city council has decided to build a subway at 22nd Street in that city at a cost of $70,000.

A by-law to raise $7,800 for the purpose of erecting bridges in the township of Amaranth, Ont., has been passed.

Contractors Robert Clark & Son are making splendid progress with the work on the new Waterway Bridge on the flats at Petrolea.

The work of building the bridge across the First River, near Port Arthur, the contract for which was let to Pease Bros., has been commenced.

At a special meeting of the Stratford city council it was decided to call for tenders for a three-span steel and a reinforced concrete bridge on Waterloo street.

The Western Bridge & Equipment Co., Chatham, Ont., has closed three contracts for steel and concrete bridges on the Romney town line, the price being $[illegible],500. The same firm has just secured contracts for two bridges at Green Valley, Renfrew Co., cost $3,600.

The steel railway bridge over the Speed river on the Dundas road, at Guelph, recommended by the chairman of the Ontario and Municipal Board, on the strength of a report from the Board's engineer, is to be built without any further delay. Engineer Malcolm's plans were accepted.

The Peterboro Council has approved of the Board of Works' recommendation that the contract for the Smith Street Bridge be let to Geo. A. Begy & Co., of St. Catharines. The bridge is to be of reinforced concrete, at a cost of $30,000. Work will likely be commenced in a short time.

Tenders were recently opened at Baden, Ont., for a new steel bridge at [illegible]. The bridge is 100 feet long with concrete floor and reinforced concrete abutments, all according to plans prepared by Bowman & Connor, of Berlin and Toronto. The steel work was awarded to the Hamilton Bridge Works Company at $[illegible],291.

To secure a traffic section on the C.P.R. high level bridge between Edmonton and Strathcona the railway company will be required to be paid for the steel and concrete work alone $586,646 by the cities of Edmonton and Strathcona and the local and federal governments. This amount is exclusive of the cost of the approaches which will bring the figure to be paid for traffic facilities alone on the bridge over the Saskatchewan close to the million dollar mark.

Planing Mill News.

The Riverside Lumber Co. will build a factory two storeys in height, and to cost $15,000, at Calgary.

The sawmill of the W. F. Hunting Lumber Co., Vancouver, which was burned on Aug. 19, will be rebuilt.

A permit has been issued for the erection of a planing mill at Riverside, B.C., for H. N. Sereth. The new building is to cost in the neighborhood of $15,000, and work on the new structure will be commenced immediately.

Marvin Millar, London, has completed arrangements with the Raymond Mfg. Co., of Guelph, for the manufacture, under royalties, of his electrical appliances at their factory in Guelph. He has been engaged to superintend their manufacture.

Heaps & Co., who have in operation large lumber mills at Vancouver and at Ruskin, at the junction of the Stave and Fraser rivers, intend to open a branch at New Westminster at an early date to handle the logs from their large limits on the Fraser river.

The expanding business of the Brantford Emery Wheel Co. has necessitated the erection of a new factory. The contract was secured by Schultz Bros. Work on the structure has already commenced and every effort will be made to have it completed early in October.

Over $20,000 loss was caused by fire which started at the Niagara Falls Planing Co.'s mill, on Sept. 15. The mill and offices were completely destroyed and lumber which can be realized on amounts to only about $2,500. The stock and building were not fully insured.

J. S. Colton Fox, an English capitalist, has purchased the works of the Crystal Glass Co., at Sapperton, B.C. He will instal new machinery and reopen the plant. The Crystal Glass Company was organized by Vancouver people three years ago, but its operations were not successful, and the plant has been closed down for about a year. Mr. Fox will also establish a chemical works near the glass manufactory.

Trade Notes.

Peacock Bros., Montreal, have moved from their old offices in the Canada Life building to new quarters at 68 Beaver Hall Hill. Francis Peacock sailed for Canada on September 27th.

The Sterling Electric Supply Co. have opened up offices at 369 Yonge St., Toronto, and will supply electrical contractors and central stations. Complete electrical lines will be carried, including the "Just" tungsten lamp.

Chapman & Walker, Engineering Contractors, cor. Lombard and Victoria Sts., Toronto, have been awarded a contract for the instalation of a 100 h.p. electric lighting type gas engine and producer plant by city of Collingwood.

The Canadian Tungsten Lamp Co., Hamilton, has been incorporated with a capital of $300,000. They will operate the works of the Ontario Lantern & Lamp Co., Hamilton. These works have been enlarged to take care of the increased lines that will be manufactured. W. H. Ginder has been elected president; F. W. Gates, vice-president, and P. D. Crerar, K.C., secretary. The machinery for the manufacture of the tungsten lamps, comes from Johan Wremenezky, Vienna, Austria, who is one of the shareholders in the new company.

The Smart-Turner Machine Co., 191 Barton St. E., Hamilton, report the following recent orders for pumps:—Geo. Coultis & Sons, Thetford; Corporation Markdale; Cobalt Power Co.; Waterworks System, Clinton; T. H. Shepard, Orillia; F. Shoe, Cobalt; Fowlers Canadian Co., Hamilton; W. Hanna & Co., Port Carling; Adams Wagon Co., Brantford; two to the Corporation of Burlington; and Coniagas Reduction Co., Thorold. The Smart-Turner Co. also report the following cranes: 15 ton to Cobalt Power Co., Gillies Depot; 5 ton to Calgary Iron Works, Calgary; and 5 ton to T. & N. O. Ry., North Bay.

Building Operations.

The E. Long Mfg. Co. has begun the construction of their new plant at Orillia.

D. Ouimet has secured a permit for a factory to be erected at Montreal at a cost of $7,000.

Barrie, Ont., ratepayers have passed a by-law granting a loan of $20,000 to the Barrie Carriage Co., for the extension of its plant.

The Sanford Mfg. Co., Hamilton, will erect a very large factory on a site just purchased at that place.

The Manitoba Gypsum Co. has a permit for the erection of a new two storey reinforced concrete factory at Winnipeg to cost $46,000.

The Tudhope Co., Orillia, whose premises were recently burned, will rebuild at once, and the work will be hastily rushed to completion.

A building permit has been issued to the Brantford Emery Wheel Company for the erection of a new factory on Pearl Street at a cost of $3,500.

The Winnipeg Ceiling and Roofing Co. is making arrangements for the erection of a large manufacturing plant at Vancouver to employ at the outset about 100 men.

The Canadian Niagara Power Co., Niagara Falls, have awarded to the Allis-Chalmers-Bullock Co., the contract for the installation of three 300 h.p. motor generator sets.

Plans are being prepared for the erection of a new separator factory at Renfrew. T. A. Low, M.P., is interested. The plant and building will represent an initial expenditure of $50,000.

Mitchell & Crighton have awarded the contract for the erection of a three-storey factory, with gas holder and oil tanks, 100,000 gallons capacity each, at Cote St. Paul, for the Blow Gas Co., to D. G. Loomis & Sons.

Negotiations are in progress for the securing of property in Edmonton, as site for the erection of a large cold storage plant, at an initial expenditure of $100,000. H. G. Nivin, of the Edmonton Produce Co., is at the head of the project.

Tenders will be received until October 14, by the city engineer, Toronto, for the following electric motors with exciters, switchboards, connecting material, etc.: Four 1,500 h.p. and four 500 h.p. and two 225 h.p. synchronous motors; two 1,500 h.p. and four 500 h.p. induction motors.

The following contracts have been closed by Regina's council: Canadian Westinghouse Co., one 500 k.v.a. low pressure turbine generator unit with switchboard panels and instrument, cost $15,000 f.o.b. Regina; Canadian Westinghouse Co., one exciter unit, consisting of Westinghouse horizontal turbine, direct connected to Westinghouse direct current turbo generator to cost $1,768; C. H. Wheeler Mfg. Co., one C. H. Wheeler improved surface condenser, $4,500.

To know every detail to gain an insight into each secret, to learn every method, to secure every kind of skill, are the prime necessities of success in any art, craft, or trade. No time is too long, no study too hard, no discipline too severe for the attainment of complete familiarity with one's work and complete ease and skill in the doing of it. As a man values his working life, he must be willing to pay the highest price of success in it,—the price which severe training exacts.—Hamilton Wright Mabie.

New Companies.

The Brantford Steel Range Co., Brantford; capital, $40,000; to make stoves and furnaces and do general foundry and machine work.

Dominion Tack and Nail Co., Galt; capital, $40,000; to make wire and wire nails, tacks, etc. Incorporators, John Sloan, J. Eatough, and J. Buchanan, Galt.

The Lyall Co., Montreal; capital $500,000; to carry on general engineering and construction business. Incorporators, R. Taschereau, R. Genest and J. Marier, Montreal.

The Whyte Railway Signal Co., Ottawa; capital, $200,000; to make Whyte railway protection and signal devices. Incorporators, J. A. Whyte, J. K. Paisley and W. J. Gerald, Ottawa.

The International Shoe Machinery Co., Montreal; capital, $400,000; to manufacture machinery for making shoes, belting, saddlery, etc. Incorporators, B. O. Beland, E. W. Gobeil, and W. Johnson, Montreal.

Montreal Manufacturers Successful.

The Simonds Canada Saw Co., Montreal, Que., with branches at Vancouver, B.C., and St. John, N.B., have every reason to feel proud of the success of their entire line of saws, machine knives, etc., having received a telegram that their exhibit at the Alaska Yukon Pacific Exposition, held at Seattle, Wash., has been awarded the grand prize. The four largest saw manufacturers on this continent exhibited, and they were the only one given the grand prize.

Electric Smelting.

Dr. Eugene Haanel, Director of Mines, Ottawa, states that arrangements are being made for establishing the first electric smelting plant in Canada, in connection with the Sault Ste. Marie Iron and steel industries. The Lake Superior Co. is arranging for the construction of a number of furnaces similar to those now in successful operation in Sweden. A second electric smelting enterprise, involving the investment of about seven million dollars, is also contemplated for the treatment of iron ores on the Ottawa River at Chats Falls, where a splendid power site has been secured by a company headed by Mr. Louis Simpson.

New Canadian Agency.

Chapman & Walker have opened up offices at the corner of Victoria and Lombard Sts., Toronto, as contracting engineers. They represent some of the largest English companies including Crossley; Dick, Kerr; Henley; Nalder & Thompson, and "Z" Tungsten Lamp Co.

The Crossley Co. are manufacturers of the well-known Crossley gas engines, several instalations having been made in Canada. Among these are instalations at James Smart, Brockville; Winnipeg municipal plant and a large plant in Cobalt.

Dick, Kerr are one of the largest British exporters of electrical machinery. They make a specialty of A. C. machinery. They have supplied a number of plants in South America. Among the Canadian instalations is a 5,000 k. w. generator for Vancouver.

Nalder & Thompson are manufacturers of ammeters, wattmeters for switchboards. Henly's are manufacturers of power and telephone cables.

B. Greening Co. Enlarging.

The B. Greening Wire Co., Hamilton, have instructed their architect, Mr. W. A. Edwards, of the same city, to prepare plans for a new wire rope factory. It will be a one story concrete and brick structure 124 ft. x 112 ft. with saw tooth roof construction. The flooring will be solid concrete so as to withstand the weights of heavy machinery and large reels of cable. It will be an up-to-date factory in every respect. Orders have been placed for additional rope machinery of the latest design. It is expected the new mill will be completed and machinery installed by first November next. The present rope mill will be used as an extension of the wire working branch of the business and will provide much needed room for the rapidly growing demand for their wire guards, garden fencing and bordering, factory lockers, etc.

CATALOGUES.

FLEXIBLE TRANSMISSION—Bulletin No. 22 of 66 pages on coated paper from Coates Clipper Mfg. Co., Worcester, Mass., describes the Coates Flexible Shaft and its application for transmitting power to various machines, such as drills of all kinds, boring machines, grinders for foundry work, finishing patterns, etc., polishing, hammers, etc. The catalogue is exceedingly interesting and is worth perusing.

The publishers will gladly send a copy on request if Canadian Machinery is mentioned.

FRICTION CLUTCH—A neat folder from the Carlyle Johnson Machine Co., Manchester, Conn., announces the opening of their new factory for the manufacture of the Johnson Friction Clutch for line shafting, countershafting in machine shops and for use on feed and speed changes in machine tools.

LOCOMOTIVES—Publication No. 100 from Milwaukee Mfg. Co., Milwaukee, describes gasolene driven locomotives. Full descriptions are given with illustrations showing their usefulness in manufacturing plants, mills, lumber yards, mines, tunnel and canal construction, etc.

GRINDING AND POLISHING MACHINERY—Catalogue from Webster & Perks Tool Co., Springfield, Ohio, describes a line of floor and bench grinders for buffing, polishing and grinding. The journals are equipped with automatic oiling devices. Prices are also included in the catalogue.

SMALL TOOLS—Catalogue 71 from Whitman & Barnes Mfg. Co., St. Catharines, Ont., 244 pages, coated paper, 6"x9". The catalogue is a very complete list of lawn mowers, tubular steel and wood frame grindstones, knife grinders, link chain belting, twist drills and reamers, hammers, spring cotters and keys, wrenches, oilers and other agricultural and machinists' supplies. Over 180 pages are devoted to small tools such as drills, reamers, etc., giving illustrations, sizes and prices. This catalogue should be in the files of every machine shop.

TOOLS—Sixty page catalogue on bond paper from James Smart Mfg. Co., Brockville, Ont., describes their hammers, hatchets and axes. The hammers are for carpenters, tinners, machinists, engineers, blacksmiths, etc. The line is very complete. The different hammers are illustrated and described and should be in the file for reference.

RENOLD SILENT CHAIN—Circular No. 5 from Jones & Glassco, Montreal, illustrates the Renold chain and shows several instalations attached to pumps, motor to line shaft, etc.

DRILL GRINDING—The Cleveland Twist Drill Co., Cleveland, O., has issued a pamphlet showing how to properly grind a drill. It shows the concise form and proper methods for grinding both the flat and the milled drill. A copy will be sent to any mechanic on application.

MUFFLE FURNACES—Circular No. 5 describes the Rockwell Muffle Furnaces manufactured by W. S. Rockwell Co., 50 Church St., New York. These are adapted for assaying and other work using oil or gas as fuel. Instalations have been made in the Royal Mint, Ottawa.

MOLDING MACHINES—A catalogue issued by the Turner Machine Co., 2049 North Second St., Philadelphia, describes their molding machines, showing by illustrations its operation. The pattern plates, flasks, etc., are also described. The catalogue also describes the Turner Automatic Cock Grinders with four and eight spindles.

SAND SIFTER AND SPRUE CUTTER—A pamphlet from Turner Machine Co., 2049 N. Second St., Philadelphia, describes a sand sifter which both mixes and sifts the sand at the same time. Included in the pamphlet is a description of a sprue or gate cutter made specially for this work.

POWER TRANSMISSION—Catalogue No. 1 from the Hill Clutch Co., Cleveland, deals with the subject of power transmission and describes their line of gears, bearings, clutches, etc.

SMOOTH-ON—This is a chemical iron compound used for smoothing over and filling up blowholes in iron or steel castings. It is fully described in the 8th edition of the Smooth-On Instruction Book issued by the Smooth-On Mfg. Co., Jersey City, U.S.A. Its use in foundry work, piping and boiler construction is fully explained and many interesting uses are described. This instruction book will be sent for the asking.

DISC GRINDERS—The Gardner Machine Co., Beloit, Wis., have issued a handsome catalogue printed on bond paper. The single sheets are bound within double covers. In addition to description of Gardner grinders for tool room and other work, F. R. Gardner, who is the inventor of the disc grinder, gives a treatise on disc grinding, incorporating tests for several grinding jobs. The data included in the catalogue is valuable, giving a good idea of what a disc grinder will accomplish.

TAPS AND DIES—Illustrated catalogue from Murchey Machine & Tool Co., Detroit, Mich., describes the tools manufactured by that company. They include automatic collapsing taps, automatic opening die, threading machines, pipe cutting off machines, tapping machnes, tapping chucks, grinders for cutter wheels and pipe dies, tapping machines, double head push nipple lathe for constant radius nipples for radiators and boilers, etc.

TURRET MACHINERY AND TOOLS—The Garvin Machine Co., Spring and Varick Sts., New York, have just issued an illustrated catalogue E, being another of the series dealing with the products of the Garvin Machine Co. Edition E deals with Turret machinery and tools, including screw machines, monitor or chucking lathes, automatic chucks (stop and open), screw head shaving machines, double turret screw machines, screw machine tools and attachments. The catalogue is printed on coated paper, 92 pages, 6x9, in English, French and German, and is well and carefully illustrated throughout.

HYDRAULIC BEAM SHEARS—Catalogue 74, from Watson-Stillman, 50 Church St., New York, deals with the Watson-Stillman hydraulic beam shear and hydraulic coping machine for shearing and trimming structural iron sections, bridge parts, ship sections, flat bars, small plate metal parts, etc., hydro-pneumatic accumulators for use in connection with the beam shears and coping machines are also illustrated.

SUPPLY CATALOGUE—The A. R. Williams Co., Toronto, have issued catalogue No. 25 containing over 600 pages, 6 x 9 ins., of machine shop supplies. The A. R. Williams Co., Toronto and Williams & Wilson, Montreal, act as Canadian selling agents for a number of United States and Canadian houses, complete lines for the machine shop being carried in stock. These include bearings, babbitted, roller and ball bearings, pulleys, belts, oil pumps, etc., traps, power plant supplies, drills, die stocks, wrenches, vises, grindstones, toolroom supplies, etc. The catalogue does not attempt to list heavy machinery but small supplies are illustrated and described. Tables of prices are also included.

ELECTRICAL TOOLS—The Dominion Foundry Supply Co., Montreal, as the exclusive Canadian agents for the Cincinnati Electrical Tool Co., are distributing their new catalogue of Peerless portable electrical drills, reamers and grinders.

FOUNDRY EQUIPMENT—Catalogue from the Dominion Foundry Supply Co., Montreal, descriptive of the various foundry requisites which they handle. Everything needed in the foundry.

CHUCKS—The Skinner Chuck Co., New Britain, Conn., 1909 Price List, 4 x 7½, 48 pages. Lathe, drill and planer chucks, face plate jaws, reamer and assembling stands, and drill press vises. Each different style of chuck is illustrated by use of fine half tone cuts on pure white stock. The company also makes special chucks for holding automobile gears and parts, in addition to chucks shown in price list. This list is sent free to anyone interested.

Canadian Machine Tool Markets

METAL MARKETS.

Metal orders have swung in well during the month, and there is a good tone to the markets. But for the fluctuations in the primary markets, quotations would have been very firm with a decided tendency to advance. But weakness in London and New York is bound to affect Canadian prices, no matter how good trade may be, unless of course there is a spot scarcity for a time. The jobbing trade have bought well, although fram hand to mouth. All the metal ordered however is used, and the markets are in the strong position of having no stocks to face. The larger metal buying interests have placed some heavy contracts to cover their winter requirements, and those who were short last year are making no mistake this time. This is especially noticeable in imported pig iron.

Inquiries show that much greater interest is being taken in the markets, and there is no doubt that when the primary markets give unmistakable signs of a steady advance that much more business will be done.

Tin has been a good seller all the way along and the jobbing price has ranged between 32c. and 33c. A recent break in the English market cut prices ½c. Copper has kept its price very well around 14c. and 14½c. The metal has sold freely and little stocks are held. Unfortunately copper in the primary markets is not so well

THE MAKING OF A SKILLED MECHANIC

By F. C. D. WILKES, B.Sc.

Complaints have been often heard, from the heads of manufacturing industries, of the difficulty of obtaining skilled labor. Some concerns have tried to meet this condition of affairs by recruiting skilled labor in their own plants, and at the present time a great deal of attention is being paid on this continent to industrial education. Some railroads and industrial firms have embarked upon elaborate schemes for the training of apprentices, and have gone as far as establishing separate and independent schools for training telegraphers, machinists, engineers, brakesmen, etc.

Unfortunately all educational schemes at present in operation on railroads (with one or two exceptions) lack continuity, for they leave off where they practically should commence and the apprentice or employee is turned out after a partial training and left to his own resources. The training offered by most companies to their employees is generally so unprofitably mismanaged by incompetent and untrained men that it is not surprising to find that managements view with suspicion any scheme put forward for raising the intelligence of their employees. It may be that this unprofitableness in many cases has been due to the fact that the recruiting or training of apprentices has been allotted to some officer of the company who already has all he can attend to. The result is a slipshod system, efficient only on paper. Another difficulty has been that in teaching the apprentice there has been but little attention paid to the difference between practice and theory, resulting in "half-wisdom" and, as every one knows, "a little knowledge is a dangerous thing."

Again, the most deplorable inefficiency of many officials and their ignorance of the economies of modern labor, probably accounts largely for the restless conditions existing to-day among employees. No heed is given to the morrow, officials give little or no thought towards making the task easier for those who have to follow them or for those who have to co-operate with them. This arises, in many cases, through incapability, for the official attains a certain standard and it is frequently found that it is impossible for him to assimilate the work of his co-officials. His deficiency prevents his further advancement and he therefore not only unconsciously hinders the work of those under him but also the work of his fellow officials. Thus it is that an official, minus early definite and concise training, becomes competent only at a large expense to the company employing him.

The ideal system of training is that one which allows an employee when he joins a railroad or other industrial corporation (provided he has the mental and physical qualifications) to be put through a systematic and continuous training which will enable him to qualify for minor positions. Then by further instruction he can consistently advance to the highest positions in the organization. The aim of any industrial system should be to create desire in the ambitious employee and enable him to rapidly and efficiently assume positions of trust and responsibility. The training of an employee should be continuous and not discontinued at the end of his apprenticeship as is often the case, the employee after desultory training being left to himself.

Foremost among our Canadian companies that have taken hold of the apprenticeship system in a rational, far-seeing manner, is the Canadian Pacific Railway. They have now under way a most complete system of apprentice training which is being developed under the direction of Mr. H. Martin Gower. Mr. Gower is peculiarly adapted to this sort of work being an enthusiastic organizer and one who has made technical and industrial education his study. He served his apprenticeship in England in the employ of the London and North Western Railway as a locomotive apprentice and then worked as a draftsman with a firm of shipbuilders. He was also, among other things, assistant mechanical engineer Cardiff Collieries and holds Board of Trade certificates as a marine engineer. His position as principal of a large English technical school has given him wide experience in this class of work and the management of boys. He is a member of several British engineering societies and, incidentally, a graduate of London and Cambridge Universities.

At the back of this apprenticeship system inauguration is the personality of Mr. H. H. Vaughan, the energetic assistant to the Vice-President, and the rapid advance of the work is largely due to the broad-minded sympathy which he has with the advancement of the employee. His own advancement since he came to this continent an unknown stranger 18 years ago has been not a little due to his concentration along such lines as are being laid down for the C.P.R. apprentices. He was born in England and graduating from King's College, London, served his apprenticeship and then worked as a machinist on the Sheffield and Lincolonshire and the London and South Western railroads. He came to the United States in 1891 and entered the employ of the Great Northern as a machinist. He became connected with the Canadian Pacific as superintendent of motive power, in 1904, coming from the Lake Shore and Michigan Southern.

Mr. Lacey R. Johnston, the assistant Superintendent of Motive Power, is an enthusiastic worker in the cause of the apprenticeship system and has always taken a considerable interest in all schemes tending to the training of the young man. When he was at the Carleton Junction shops and the old Delorimier shops in Montreal he entered the thin edge of the wedge and instituted evening classes for employees in his department. He has been with the C.P.R. for over twenty years in the steamship and motive power departments holding positions of locomotive foreman, master mechanic and

superintendent of steamships. He was appointed to his present position four years ago.

Fig. 2.—F. B. ZERCHER.
Superintendent Car Shops.

The Superintendent of the car shops, Mr. F. B. Zercher, is another devotee to the cause and has had a good deal of experience in railway work both on this and the other side of the line. He was born in Lancaster, Pa., and was with the Pullman Co., St. Louis, for seven years as foreman of the erecting shop. After serving with the New York, New Haven and Hartford Railway as inspector he came to Montreal and entered the employ of the C.P.R. as assastant general foreman.

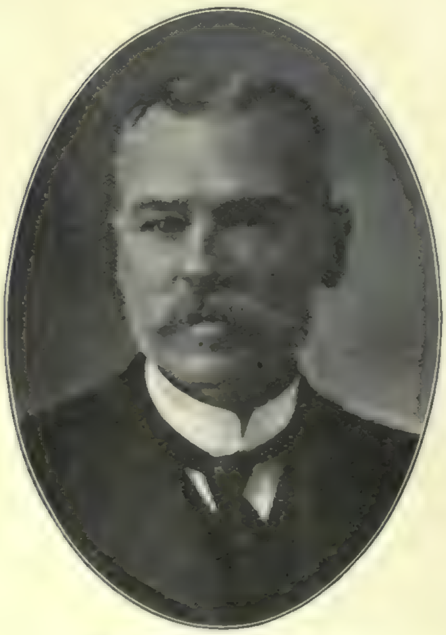


Fig. 3.—LACEY R. JOHNSON.
Asst. Supt. Motive Power.

With these men in the work must be mentioned, Mr. R. W. Burnett, the General Master Car Builder for the whole C.P.R. system. Mr. Burnett is enthusiastic over the results of the apprenticeship work so far shown and thoroughly believes in its practicability.

Mr. Gower is assisted by a staff of instructors selected from men and foremen of high moral character. These men possess the knack of imparting their knowledge and skill and the faculty of instilling into the boys an interest in their work. They devote their whole-time to the system and the keynote of their efforts may be found in Mr. Gower's own words when he says:

"A great deal of stress is being laid on the educational side, but to my mind the most important factor is the moral training, which it is essential our boys should receive, for, as we now train our boys, so will our men be in the future. Therefore every care should be taken to train them to become honest, straightforward, well disciplined and self-respecting men who will be conversant with shop organization and realize that foremen are appointed by employers, not for the purpose of standing over them to see that they do their work, but to allot and give out the work required by their employers."

Underlying all the best systems that were ever devised is the first essential that the apprentice should be taught to think in measurable quantities—in otherwords, think definitely. The priniciples of the trade in view should be carefully instilled into the boy's mind after which the details will not be hard to master. However, to do this properly the system should "make haste slowly" and should be designed to meet the requirements of the backward rather than the bright, capable lad, the latter will make his advance all right and by himself. Slowness in preparation is essential to the competent workman.

It is, generally speaking, upon these broad lines that the C.P.R. apprentice system is based. Besides the teaching, the company feel that it is also important how the men spend their time outside of working hours and with that end in view are always willing to assist in providing healthful recreation and opportunities for mental and physical advancement.

This is not the effect of a philanthropic view point. Not a bit of it. The company frankly admit that this considerate treatment and the large amounts of money spent on the apprentice system is in anticipation of large dividends on the investment. They recognize the policy of giving every chance to their employees to learn the business and to qualify for advancement to higher positions. Each year a larger sum of money is spent on special work for their men and the officials of the road are perefectly satisfied that this increasing expenditure is being abundantly justified from both the humanitarian and business standpoints.

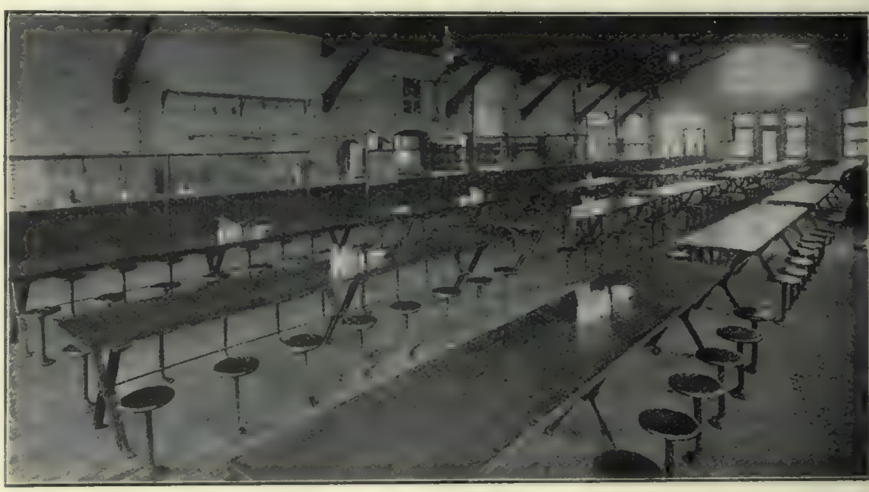


Fig. 5.—Dining Room, Angus Shops.

The Synopsis of the System.

The first apprentice class was organized and held at the Angus shops in Montreal about eighteen or twenty months ago and at the beginning of this year the scheme was adopted in the Winnipeg shops. Here the same general lines as those in the Angus shops are followed although local conditions necessitate the modification of the details.

Every facility is placed in the way of the ambitious and intelligent employee to receive instruction from qualified and experienced officials in shop and railroad practice. The trend of this preliminary training has the tendency to create a desire to advance in the aspiring lad. The training is progressive—starting first with educational instruction for the young employees, then advancing to shop and educational instruction for the ap-

prentices and finally the journeyman receives educational facilities which enable him to qualify for minor positions on the staff.

Entrance Requirements for Boys.

Extracts from the "Regulations Governing the Services of Apprentices and Boys" show that it requires more than the mere application for admission befor a boy becomes a full-fledged apprentice. First of all he must pass an examination by the company's doctor, who sees that his eyesight, hearing and general health are good, after which all boys between the ages of 15 and 21 are accepted on approbation. When there is no vacancy for an apprentice, applicants are distributed through the various departments as drill boys, hammer boys, office boys, blue print room boys, etc., until such time a vacancy shall occur.

Apprentices are on approbation during their first year and at the end of the year are expected to pass an examination in: Reading and dictation, elementary arithmetic, freehand drawing of mechanical objects, Canadian history and geography.

In the latter class stress is laid upon the geography of the C.P.R. system and biographies of the chief officers and other eminent Canadians. This with the obvious end in view of making each boy thoroughly acquainted with the whole system so that he will have more conception of what and whom he is working for. Thus he will become a C.P.R. man in heart as well as in name. Besides this preliminary education they must show some aptitude for the work on which they are employed and their conduct, punctuality and attendance must be satisfactory, otherwise their services as apprentices will be dispensed with.

The Various Classes and Trades.

Irrespective of the trade the apprentice has in view, the first year's classes are the same for every boy.

These classes take up the preliminary work as outlined above. After the first year the boys are advanced to what is known as the general instruction class. Here the work is in freehand drawing, geometrical drawing (elemental), elemental projection and development, mechanical drawing and shop mechanics. This latter embraces the principles of friction, levers and simple machines. After this course is completed the boys are allowed to specialize along lines complementary to the shop practice of the particular trades which they are following.

Fig. 6.—Class in Drawing.

There are thirty trades to choose from of which the following is a list: Locomotive machinist, toolmaker, brass finisher, electric mechanic, boilermaker, silversmith, locomotive blacksmith, carpenter, locomotive draftsman, locomotive steamfitter, locomotive painter, patternmaker, air brake fitter, locomotive fitter, frog fitter, car machinist, tinsmith, coppersmith, car blacksmith, car plumbers, cabinet maker, upholsterer, moulder, freight car carpenter, car steamfitter, wood machinist, coach carpenter, car painter, car builder, car draftsman.

Shop Training.

An idea of the length of time spent on the various divisions of work which go to make up these trades is given by the following excerpt from "Regulations Governing the Services of Apprentices and Boys":

Machinists.

The five-year course for machinist apprentices will be as follows:

1. Experience on machines, 24 months.
2. Experience on bench work, 18 months.
3. Experience in erecting shop, 18 months.

In detail.

(1) Experience on Machines.

Shapers and slotters, 3 to 6 months; planers, 2 to 4 months; millers, 2 to 3 months; lathes, 4 to 8 months; drills, 1 month; other machines 2 to 4 months. Total, 14 to 26 months.

(2) Experience on Bench Work.

Class "A."

Truck work, main frames, brass work, smoke box doors, cross head work, marking off work, side rod work, air brake work, axle box work.

Fig. 8.—Apprentices at Work on Locomotive.

Class "B."

Axle work, motion work, valve work, cylinder work, brake gear work, marking off work, air brake work, brass work, side rod work.

Apprentices will follow either course

"A", or course "B," and will not work less than two months nor more than three months on any class of work.

1 to 2 months; boiler setting, 2 to 4 months; general engine work, 3 to 6 months. Total, 18 to 34 months.

Fig. 10.—Football Team, Apprentice Association, 1909.

(3) Erecting Shop Experience.

Brake, gear and spring work, shoes and wedges, 2 to 4 months; motion work, 3 to 5 months; steam chest work, 3 to 5 months; cylinder fitting, 2 to 4 months; valve setting, 2 to 4 months; pop setting,

Brass Finishers.

The five-year course for apprentice brass finishers will be as follows:

1. Experience on machines, 3½ years. 2. Bench work, 1 year. 3. Experience in plating and oxidising, 6 months.

In detail.

Experience on Machines.

Drills, 9 to 12 months; millers, 9 to 12 months; lathes, 18 to 30 months. Total, 36 to 54 months.

(2) Experience on Bench Work.

Brass fitting and brass filing 9 to 12 months.

(3) Experience in Plating and Oxidising.

Plating, 2 to 4 months; oxidising, 2 to 4 months. Total, 4 to 8 months.

Experience in the plating and oxidising rooms will only be given to those apprentices who make the best progress.

Boilermakers.

The four-year course for apprentices will be as follows:

Light sheet iron work, 18 to 24 months; marking off work, 6 to 12 months; boiler staying, 2 to 4 months; riveting, chipping and caulking, 6 to 12 months; flanging 4 to 9 months. Total, 50 to 82 months.

All boiler maker apprentices will put in from three to six months as rivet boys before they are apprentices.

Pattern Makers.

The five-year course for apprentice patternmakers will be as follows:

General helping in pattern shop, 9 to 12 months; Foundry or molding floor experience, 3 to 6 months; bench work, 54 to 66 months. Total, 54 to 66 months.

Steam Fitters.

The four-year course for apprentices will be as follows:

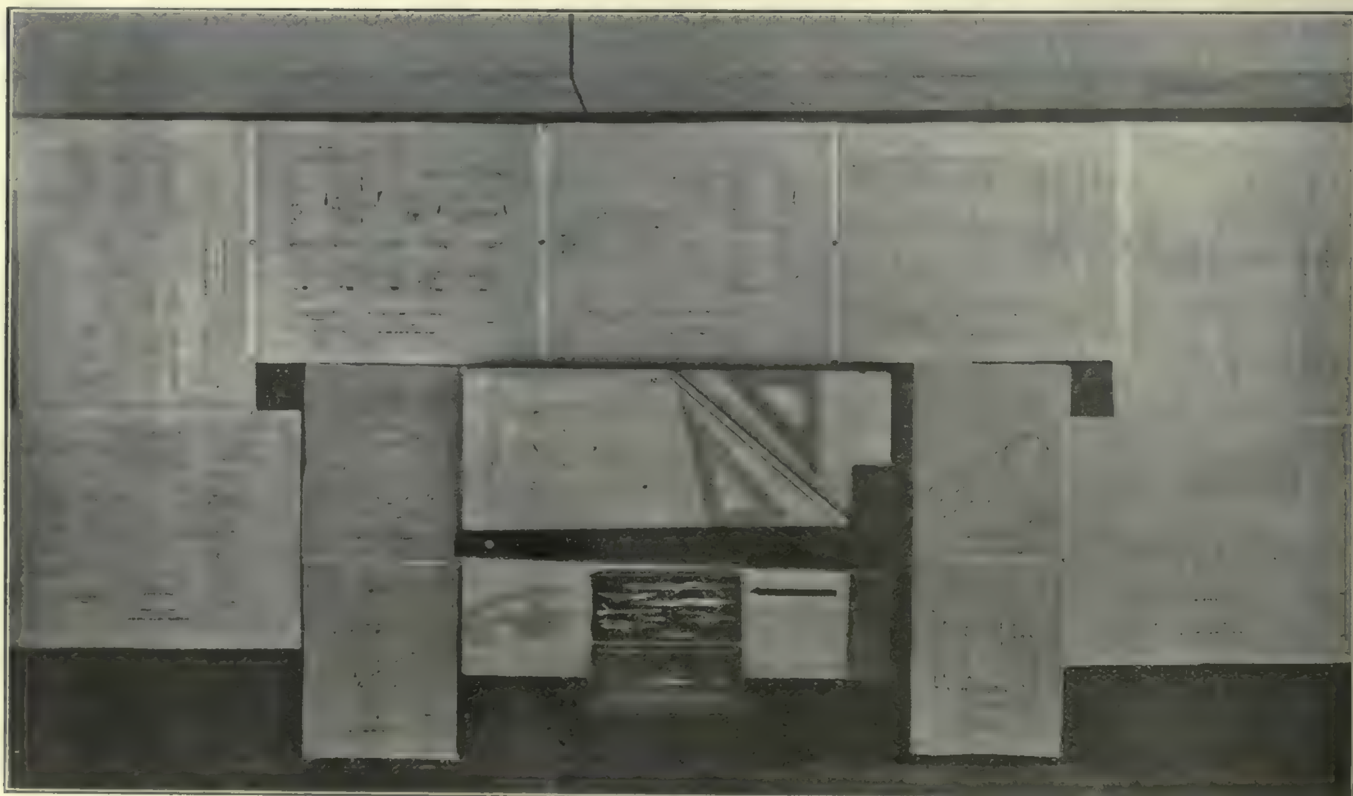


Fig. 11.—Instruments Supplied by the C.P.R. With Lesson Sheets in Various Departments.

General helping in steamfitters' shop, 6 to 12 months; injector and lubricator pipe work, 9 to 12 months; air brake pipe work, 12 to 18 months. Total, 36 to 54 months.

(3) Bench Work Experience.

	Months
Die, punch and jig work on bench	12 to 15

Wiring—

	Months
(a) Small current work, (Telephones, bells, fire alarms, etc.)	3 to 5
(b) Power and lighting, (open, concealed and conduit)	3 to 5
(c) Outside line work	2 to 4
Repair work, (armature winding, transformers, motors, etc.)	8 to 12
Head lights (mechanical and electrical)	6 to 8
Instalation of electrical machinery	3 to 6
Motor crane and lighting operations	6 to 9
Reading instruments and testing	3 to 6
Power house work, (boiler-room, engine-room and switch-board experience) ...	4 to 8

Total—50 to 81 months.

Car Builders.

The five-year course for apprentice car builders will be as follows:

	Months
Helping bench carpenters	12 to 15
Construction of passenger and freight car trucks	9 to 18
Construction of passenger and freight car platforms—	
Iron	6 to 13
Wood	6 to 13
General car detail work	12 to 24

Total—54 to 101 months.

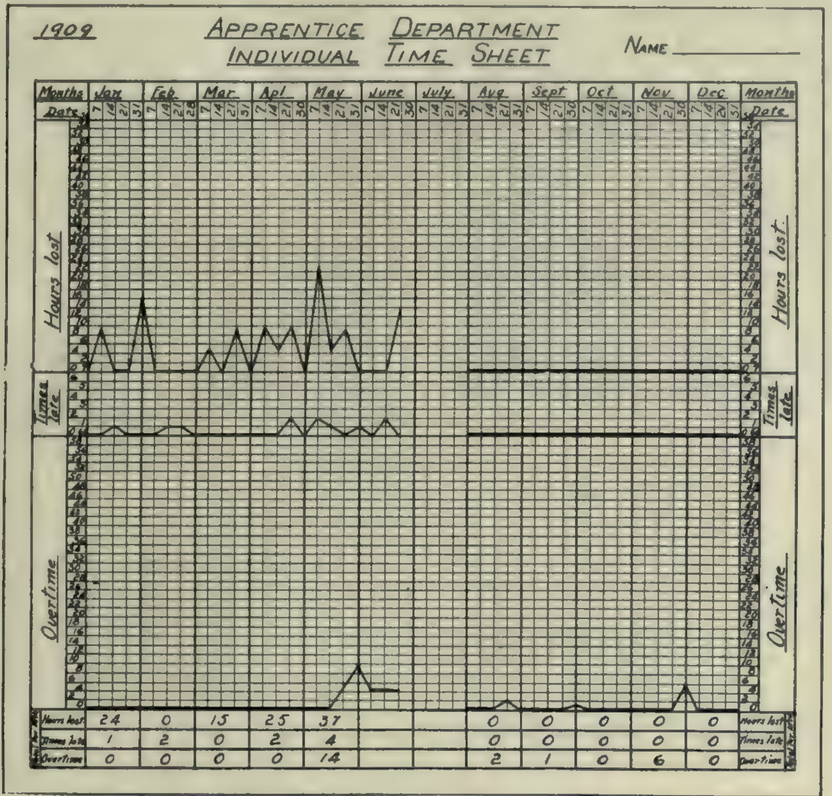


Fig. 12.—Apprenticeship Department Individual Time Sheet.

Painters.

The four-year course for apprentice painters will be as follows:

General helping and paint mixing, 9 to 12 months; rough stuff and plain painting, 9 to 12 months; graining, filling and polishing, 12 to 15 months; lettering, staining, striping, varnishing, 12 to 18 months. Total, 42 to 57 months.

Toolmakers.

The five-year course, for apprentice tool makers will be as follows:

(1) Experience on machines in machine shops, 6 to 12 months. (2) Experience on machines in tool shop, 36 to 54 months. (3) Bench work experience, 12 to 15 months.

In detail.

(1) Six to twelv months general machine shop experience

(2) Experience on machines in tool shop.

	Months
Small lathe (repair work)	4 to 8
Plain milling machine	4 to 8
Shaper	3 to 6
Cutter, grinder	3 to 6
Universal miller	4 to 8
Various lathes	12 to 18
Machine repair work	3 to 6

Total—36 to 66 months.

Electricians.

The five year course for apprentice electricians will be as follows:

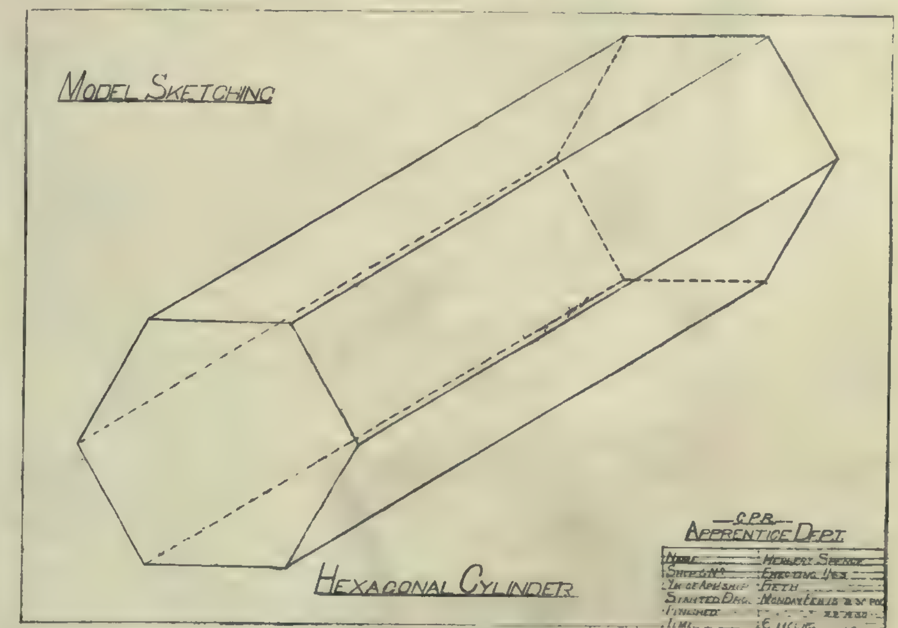


Fig. 13A.—Sample of Freehand Drawing.

	Months
Machine shop work— (Lathe, bench, brass work, pipe work, drills)	12 to 18

Molders.

The three-year course for apprentice grey iron molders will be as follows:

	Months
Helping around shop	3 to 6
Light work	6 to 9
Loam work and core-making...	9 to 15

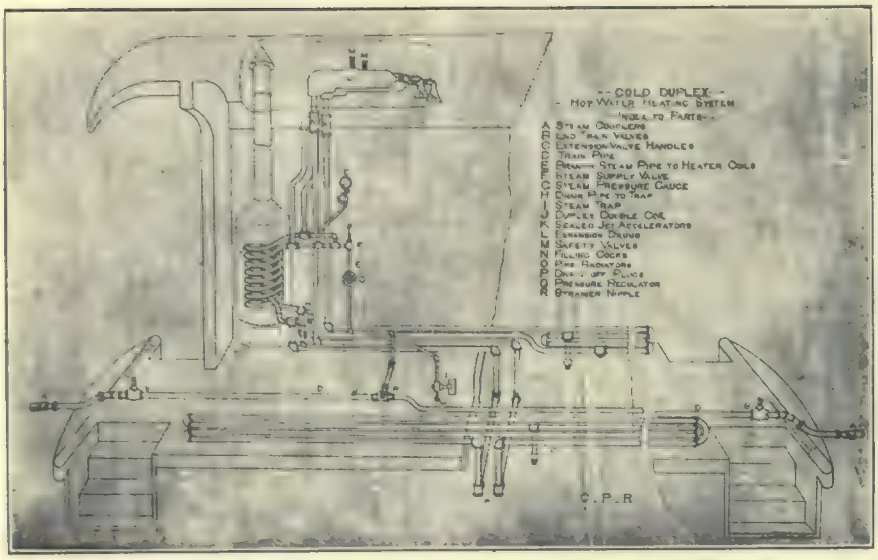


Fig. 13B.—Specimen of Mechanical Drawing.

	Months
Furnace work	3 to 9
Machine molding	6 to 12
General work	12 to 18

Cabinet Makers.

The four-year course for apprentice cabinet makers will be as follows:

	Months
Helping in cabinet shop	6
Bench work	30 to 40
Machine work	3 to 6
Outside work	6 to 12

Blacksmiths.

The four-year course for apprentice blacksmiths will be as follows:

	Months
Hammer and helping around shop	3 to 12
Light fire work	18 to 24
General work	24 to 36
Heavy fire work	6 to 12

Plumbers.

The four-year course for apprentice plumbers will be as follows:

	Months
Helping around shop	3 to 6
Helping plumbers	12 to 24
Jointing, bending, wiping, etc.	12 to 24
General plumbing	24 to 36

Carpenters.

The four-year course for apprentice carpenters will be as follows:

	Months
Helping around shops	3 to 6
Machine work	3 to 6
Bench work	18 to 24
Inside or outside car work	24 to 36

These schedules, which show the minimum and maximum amount of time the apprentice should be engaged on each

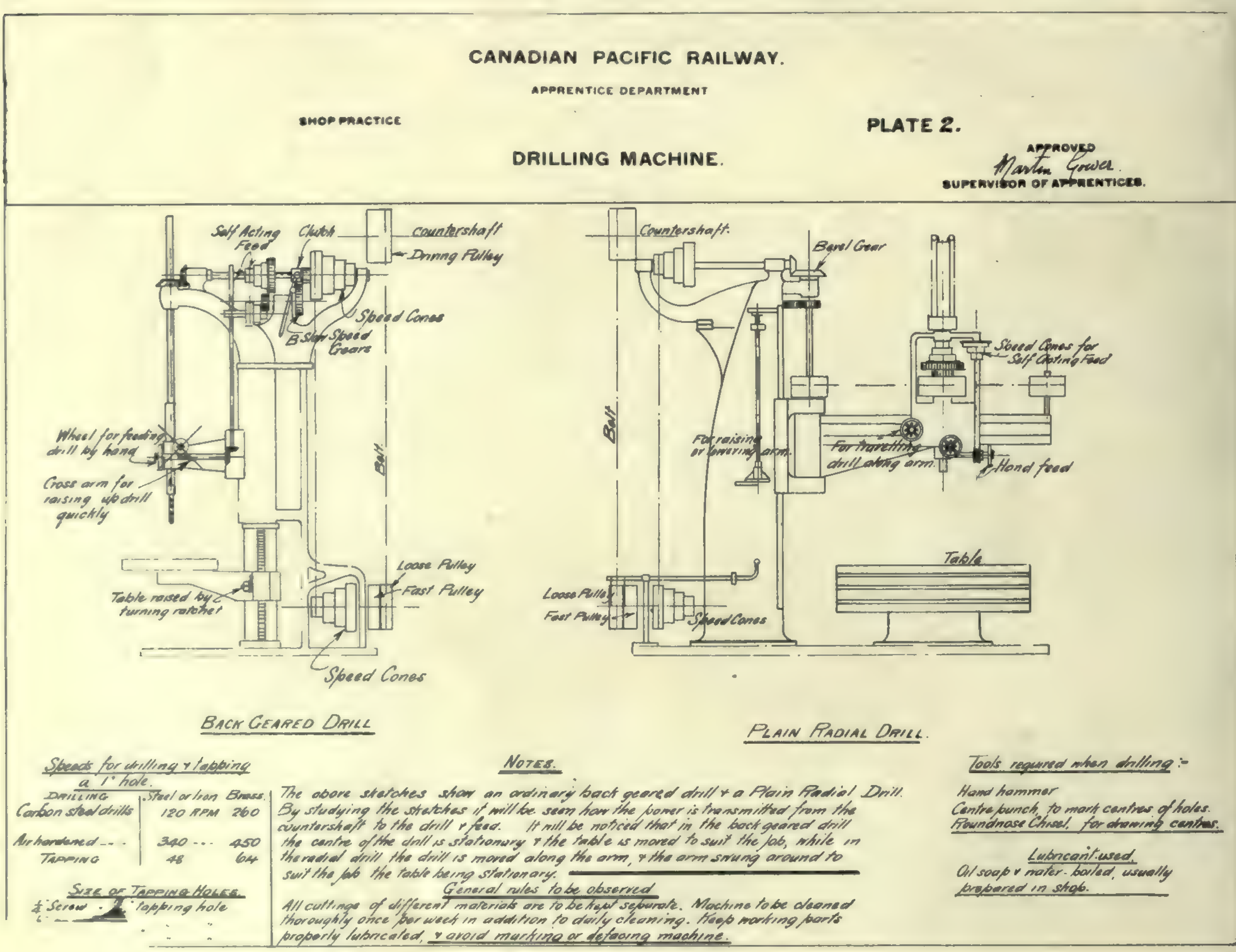


Fig. 14.—Sample of Shop Practice.

class of work, are adhered to as closely as possible although the apprentice does not necessarily pass from one class to another in the order given. The variation, as shown above, is arranged to suit the progress made by the boy and therefore depends a good deal upon himself. The shop instructors make weekly reports of the work done by each apprentice under his charge.

Shop Work and Instruction.

In the shop the boys are grouped under the supervision of the different shop instructors. These men are expert machinists or carbuilders or whatever class of work in which they instruct, and their duties consist in looking after the boys under their charge, showing them how to set up their work. These men do not allot the work (the foreman does that), they merely stay with an apprentice until the lad understands the work thoroughly. Under the old system the foreman was supposed to instruct the apprentice. Sometimes he did and sometimes he didn't. It invariably happened that he would be interrupted several times, and the boy would get a jerky, disjointed explanation hard to understand and difficult to apply. Often the foreman would be called away in the middle of a demonstration, expecting, of course, to return and get the boy started. The chances were that the boy would be forgotten and left to shift for himself. Under the old way a boy might produce 50 per cent. of a mechanic's output after three or four weeks' work on the same machine, but under the new system, an apprentice can be put on an absent workman's work and, with the assistance of the instructor, the output suffers but little. Usually an apprentice under the new system turns out ½ to ¾ of a mechanic's output inside of three or four days. Thus is the work of the instructor productive of immediate returns.

In connection with the shopwork, considerable care is taken to see that the boy thoroughly understands the mechanism of the machine on which he is working. Of course, he doesn't take long to learn that a lathe, for instance, derives its power by means of a belt from a countershaft, and turns the work because the work happens to be fastened to the face-plate. But the company goes further and demands that the boys learn just how this power is transmitted and the internal arrangements of the machine they work on.

Blue print diagrams of the machines are furnished, which show the different methods of applying the laws of leverage and other mechanics. A boy is sometimes asked the shape of some internal part of a machine, and if he cannot give a rough sketch of it, is told to get a wrench, open up the machine and find out for himself, make a sketch and put it away. In this connection note boks are encouraged.

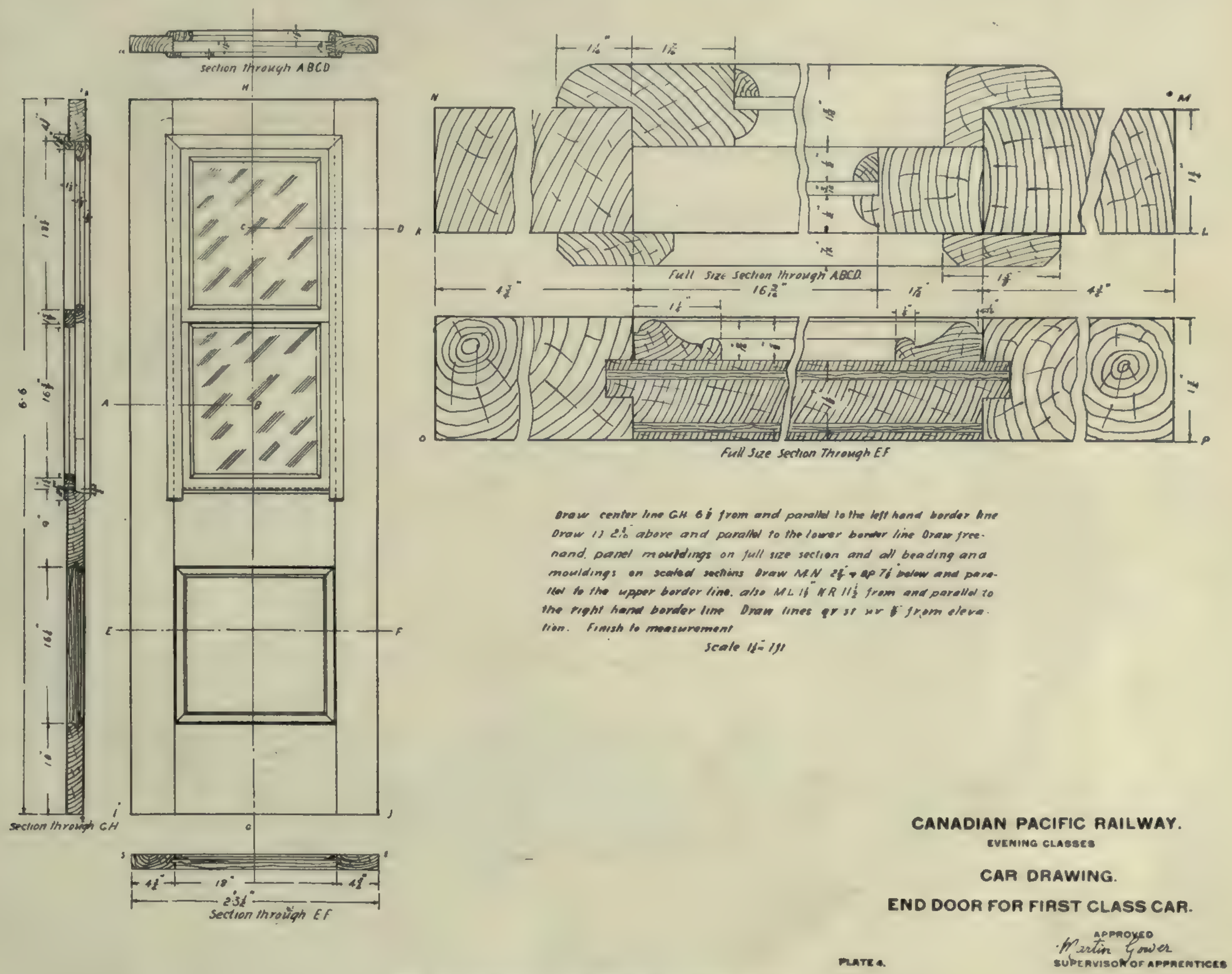


Fig. 15.—Sample of Car Drawing Lesson Sheet.

Testing Department.

Work in this department is not in the apprenticeship course proper, but on ac-

count of the easier and cleaner work is held out as a part of reward for merit. Boys in the 4th or 5th year of any of the courses are eligible, three at a time being taken for from four to six months.

The work consists of physical tests of merchant iron and steel and other general testing. These boys conduct tests of their own after having had the process explained to them, and help in any special investigations such as testing of springs, etc. They are encouraged to compile notes of the work done, in a convenient form of note book, but this is optional. However, most of the boys are wide enough awake to be aware of the value of such notes, and few there are who do not keep them. These boys are given access to text books on testing and the pamphlets on the subject, etc., issued by other railroads.

Sometimes the boys are called on to assist in testing lantern globes for strength and heat resistance. In the first instance the drop test is used, whereas in the latter the globes are heated (as when used), and sprayed with water, and the extent to which they withstand cracking is noted.

This department is under the charge of Mr. E. B. Tilt, the Assistant Engineer of Tests.

Methods of Class Instruction.

The class work is devised so that the class room has the closest possible connection with the shops, so much so that the drawings and lesson sheets are literally covered with the dirt and grease from the shops. Freehand drawing is taught from actual objects, a few of which are shown in the accompanying photograph. Each apprentice is kept at one particular object until his drawing receives the O.K. mark of the instructor. The accompanying photograph shows a drawing done absolutely freehand, and is one that many draftsmen could not improve on even with the aid of drawing instruments.

When drawing of actual machine parts are to be made, the apprentice is given the part he is to draw, and a blue print sketch with the dimension lines on it, but no dimensions. He then makes a freehand sketch of the object and takes his own dimensions of it after which he makes his mechanical drawing, putting in the dimensions as shown on the blue print sketch. The object of the blue print is merely a guide to show the correct way of dimensioning the drawing. In this way the apprentice is taught just what dimensions are essential and so there is no danger of the drawing being difficult to read on account of a mass of useless dimensions. The importance of this will be recognized by many a chief draftsman and machinist.

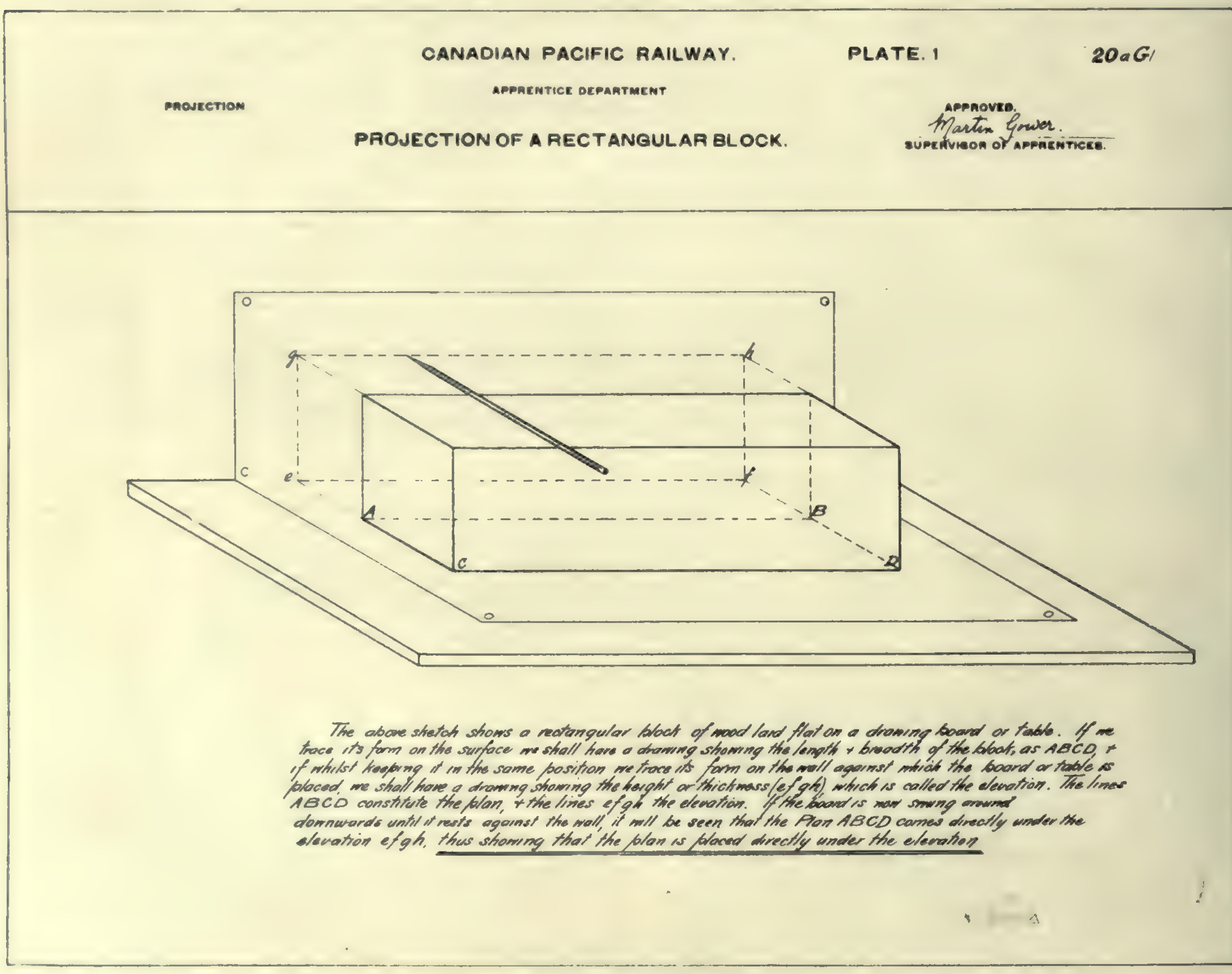


Fig. 16.—Sample of Projection Lesson Sheet.

In connection with this work it is obvious that the instructor should be at once kindly, patient and withal firm. Discipline is not hard to maintain as the boys are paid for the time spent in the class room, but usually they are so interested in their work that little or no trouble is experienced along this line.

Considerable attention is paid to teaching the boys the use of the various

scales. This takes the form of what might be termed "Practical shop mental arithmetic." They are led from the simple problem of "what is the half of ¼," etc., up to where they are asked to multiply and divide larger and more complex fractions. As the progress is very slow and all the fractions are the multiples of two, as used in the shops (1-16, ⅛, ¼, ½, etc.,) the result is thorough. The boys are encouraged in up as the problems gradually become more difficult.

No text books are used in either the drawing or the problem courses, but as stated above the problems are arranged on sheets, and in being allotted a problem it does not always follow that each boy in the class is working on the same problem. As soon as he is finished with one he is given another.

In the apprenticeship classes, in order

Drawing Equipment Supplied.

The equipment furnished each boy consists of a pine drawing board 18" x 24" finished in shellac, a T square, 60 and 45 degree triangles, triangular box scale, wooden curve, file for sharpening pencils, pencils, pens, ink, necessary drawing and tracing paper, and a set of drawing instruments. All of this equipment is furnished by the company and thus the instruction does not cost the

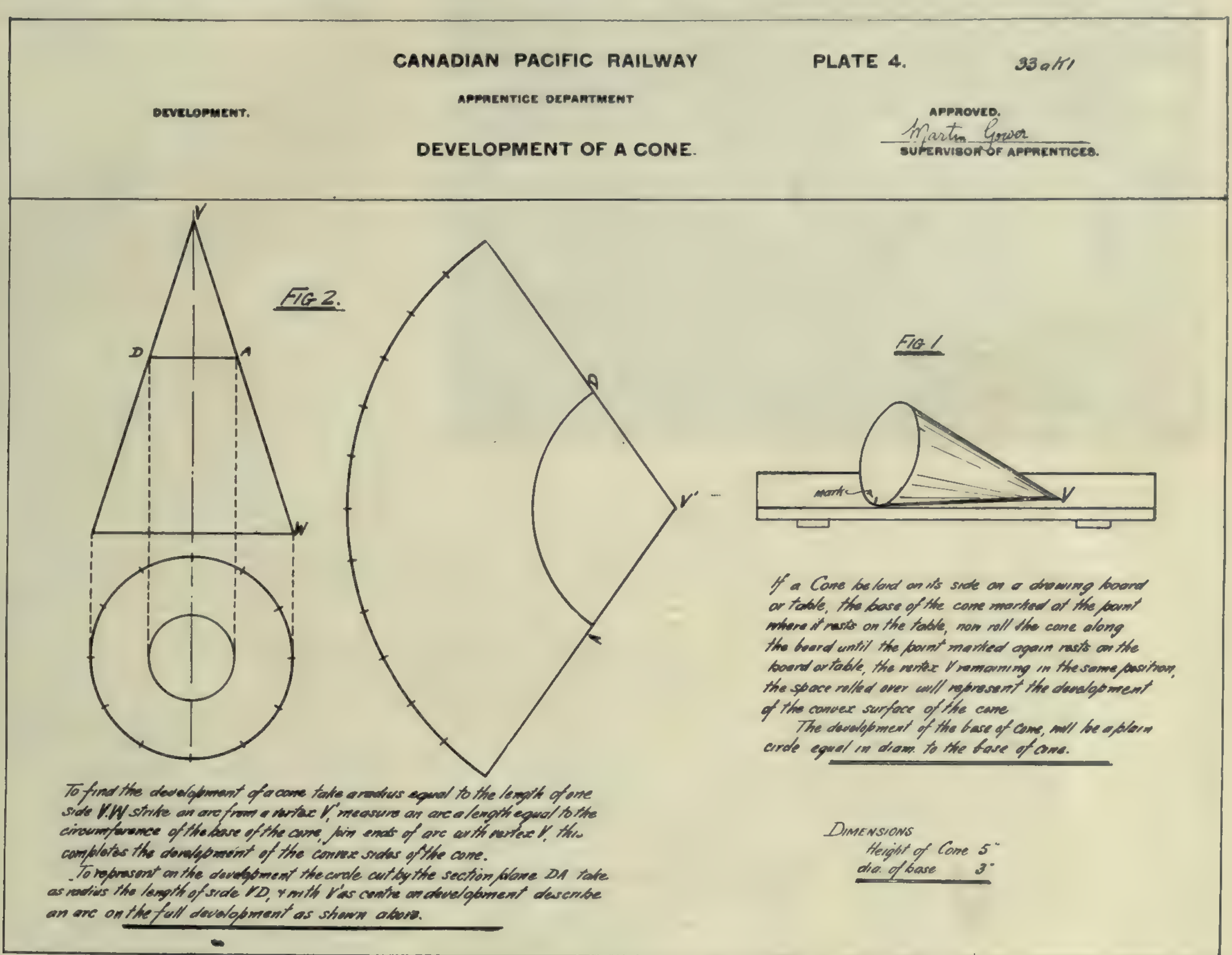


Fig. 17.—Sample of Development Lesson Sheet.

asking one another questions, and of course, each is anxious to puzzle the other.

The problem courses are based strictly upon the work with which the apprentice comes in daily contact in the shop. All useless and puzzling higher flights of mathematics are eliminated. The work in the shop is referred to even in the simplest problems of addition and subtraction. New principles are evolved gradually and here, too, the progress is slow and very thorough. The simpler principles of elementary mechanics, algebra, geometry, physics, etc., are taken to stimulate enthusiasm and interest, the company donates each year 10 scholarships. These consist in complete courses in mechanical, boiler, car or electrical engineering following those of the International Correspondence Schools but taught by the company's own instructors. The two main scholarships are those which are given each year to sons of employees and which give the fortunate winners a full four-year course at McGill University, Montreal The holders of these are employed in the company's shops during vacation, receiving remuneration for their services.

boys anything, either in the way of time or money.

French Apprentices.

The Angus shops being situated in Montreal and deriving a large proportion of the men from the French population, it was decided, last spring, to instal an instructor capable of teaching English to the French apprentices. Mr. Henry Vezina was given the appointment. Prior to this he had charge of the cabinet mill. In addition to his duties of instructing the French apprentices he also has charge of the practical work in

the car department. Each French boy who is unable to speak English receives, during working hours, two hours of instruction per week in reading, writing and conversational English. These French boys are taken into the shops on an equal footing with the English apprentices, but at the end of 12 months must pass a simple examination in the English language.

Fig. 18.—Class Work in Instruction Car.

Records Kept.

From the time an apprentice enters the service of the company until he finishes his apprenticeship a record of his career is carefully kept on file, in the office of the supervisor of apprentices. The front and reverse sides of one of these cards is shown. They are 8¼'' x 10½'' and contain the whole five years record on the one side of the card and general information relating to the boy on the other. This record is filled in every month from the monthly reports sent in by the different instructors.

The mark on workmanship is based on ability shown by the boy and the quantity and quality of work done in the shop. The same applies to the drawing classes, but here is taken into account the attitude of the apprentice towards his studies.

The personality or deportment mark is based on the attitude the apprentice takes towards his work, his willingness to serve and be instructed, his general character, and his ambition, i.e., whether or not he is doing his best.

The boys are allowed to see their marks at stated intervals by applying to the Supervisor, and are given a report at end of each year.

Another interesting record is the individual time sheet, kept by each apprentice by himself. On this sheet a sort of curve is made for hours lost, times late, and overtime, the points in the curve being put in at weekly intervals. The record of any apprentice's time can be read at a glance from these sheets, and the effect of their institution has been remarkable. Where there were from 100 to 200 lates per year, there are now hardly more than 2 per month, and the precentage of boys who are not late at all has been increased 30 per cent.

CANADIAN PACIFIC RAILWAY COMPANY
ANGUS SHOPS
APPRENTICE SERVICE CARD

CLASS OF APPRENTICE Machinist

Name of Apprentice—in full John Brown
Date of Birth June 24, 1891
Address 81 St. James St
Living at Home or Boarding Boarding
Parents' or Guardians' Address Morrisburg, Ont.
Parent's Occupation Farmer
Commenced Apprenticeship Sept. 1, 1907
Age on Commencement of Apprenticeship 16 years, 3 months
Terminated Apprenticeship
Age on Termination of Apprenticeship years, months.
Age on leaving School or College 16 yrs.
Service since leaving School or College

Name and Address of Employers	Occupation	Dates of Service From	To	Salary	Reasons for Leaving
at School & on the farm					

Nationality Canadian
Condition of Eyesight Normal
Condition of Hearing Normal
Physical Defects None
Height in Inches 5 ft. 8 in.
Chest Measurement 38"
General Health Strong & healthy
Personality Bright, intelligent inclined to be weak in some things
General Intelligence average
Where Educated Morrisburg, Ont.
Knowledge of Arithmetic Good, including fractions
Knowledge of English writing, speaking & reading fair
Knowledge of Geometry and Drawing Nil
Knowledge of Mathematics Nil
Knowledge of Games Plays Baseball & Hockey
Estimate of Apprentice Will turn out an average Mechanic.

Fig. 19A.—Front Apprenticeship Service Card.

Application Forms, Etc.

When a boy makes application for position as apprentice, he fills in the following form:—

Apprentice Department.

Apprentice Application Form.
Date of Application........................ ....
1 I hereby apply for situation as....................
2 Name in full (no initials)..............................
3 Age in years last birthday............................
Year and month of birth..........................
4 How long have you been resident in Canada
....
5 Home address ....
6 Are your parents living................................
7 Where were you born....................................
8 Do you reside with your parents..................
If not what is your boarding address.........
....
9 What is the occupation of your father...........
....
10 Where were you educated...............................
11 How far did you go in Arithmetic ....
12 Can you do Free hand drawing.....................
13 Are you able to read, write and speak the English language.............. ....
14 Are you able to read, write and speak the French language.......... ....
15 How long is it since you left school...........
....
16 What have you been doing since you left school.................. ....
17 Have you had any previous experience...........
18 What is your height.......................................
What is your weight...................................
19 Have you any physical defects, as lameness, deafness or short-sightedness......................
Recommended by....................... ....
Interviewed by ....
Started in shops.. ....

The applicant is then put through a personal examination, which amounts to a conversation with the supervisor, and is led to talk about what he does in his spare time, the books he reads, the games

he plays, etc. In this way is gotten more or less of an insight into the applicant's character, which is held to be far more important than his knowledge of arithmetic and algebra.

The record of the apprentice's medical examination is kept on the following form:—

Application for Apprenticeship.

Medical Examiner's Form.

1 Name of applicant in full.............................
2 Age in years and months.............................
3 Height is...........feet...........inches.
4 Weight.....................lbs.
5 Is applicant over or under normal weight for age?..................... ....
6 Circumference of chest (a) expiration...........
....
Inspiration ....
7 Is the character of the heart's action uniform, free and steady?...............................
8 Are the valvular sounds healthy?........... ......
9 Eyesight test ....
10 Hearing test ....
11 Is the applicant temperate?...............................
12 Is the applicant addicted to the use of tobacco in any form?...............................
13 If the applicant is ruptured or any other deformity, examine and describe it and state your opinion............. ....
....
14 Do you consider the applicant is physically and mentally fitted to undergo the necessary training for a.. apprentice?.................. ....
15 Does the applicant present the appearance of good health? ....
16 Has the applicant been vaccinated?...............

I certify that the answers to the questions above are in my own hand-writing and that I have made a physical examination of

....
Examined at..........................date..................... 19
Signed.. .........M.D.

Form to be returned to the Supervisor of Apprentices, Angus Works, Montreal.

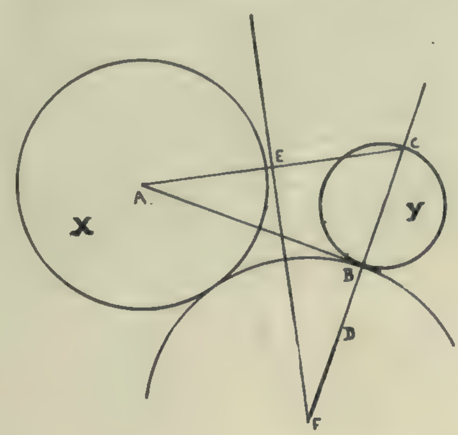
These two forms are type written and memeographed on foolscap paper in the company's office.

CANADIAN PACIFIC RAILWAY COMPANY.

APPRENTICE DEPARTMENT.

GEOMETRICAL DRAWING. 15 a G 2.

TO DRAW A TANGENT CIRCLE TO TWO GIVEN CIRCLES.



Let X and Y be the two given circles X having a radius of 2" and Y a radius of 1". Let the distance between the two circles be 4". It is required to draw a circle touching the circumference of the two given circles.

From the centre A in circle) draw a line at a tangent to circle Y touching the circumference in B.

From B draw C D perpendicular to A B.

Cut off B C equal to the radius of circle X. Join A C. Bisect A C at E and at E erect a perpendicular and produce it until it meets B D produced in F.

F IS THE CENTRE OF THE CIRCLE WHICH IS TANGENT TO THE TWO GIVEN CIRCLES.

Fig. 20.—Geometrical Drawing Instruction Sheet.

Then an agreement is entered into between the applicant's parent or guardian. This agreement is a printed form as follows:—

Apprentice Department.

....190

The undersigned, residing at.............................. agrees that (his son, ward).................................... shall serve the Canadian Pacific Railway at the ...., as a.. apprentice, for the full term of..............years, commencing..............................Each year to consist of two hundred and ninety (290) working days, worked, and time lost from this must be made up before advancement to the next year.

He shall be subject to the rate of pay and rules governing the services of employes issued by the company.

He shall not be allowed to join any trades union until he has completed his full term of apprenticeship.

The Canadian Pacific Railway Company reserves the right to dismiss the apprentice for cause.

The company will, upon the completion of a satisfactory apprenticeship grant the apprentice a certificate of apprenticeship.

....
Guardian or parent's signature.

....
Apprentice's signature.

Witnessed on behalf of the company:
....
Approved:
....
Head of department.

The form filled in by those wishing to take the scholarship examinations is as follows:—

RECORD OF SERVICE

G.—Good.
M.—Medium.
S.—Slow.
S. P.—Slow but Promising.
U.—Unsatisfactory.

Name of Apprentice John Brown
Trade Machinist

Year.	1908												
Month.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Shop.	West Machine												
Times Late.	0	0	0	0	1	0	1	0	0	0	0	3	5
Hours Lost.	0	0	10	6	0	3	100	0	4	3	8	0	134
Class of Work.	Plane Shaper Bench												
Progress.	M	G	G	G	G	G	S	S	M	M	G	G	
Rate.	14								12				
Work in School.	G	G	G	G	G	M	G	M	S	S	G	G	
Times Absent.	0	0	1	0	0	0	10	0	0	0	1	0	12
Progress.	M	G	G	G	G	G	M	S	S	M	G	G	
Year.													
Month.													
Shop.													
Times Late													
Hours Lost.													
Class of Work.													
Progress.													
Rate.													
Work in School.													
Times Absent.													
Progress.													

Estimate of Apprentice.
1 Workmanship.
2 Timekeeping.
3 Character.
Finished Apprenticeship.
Subsequent Service.

Fig. 19B.—Back Apprentice ship Service Card.

Application Form for Apprentice Scholarship Examination.

Applicants should read the questions carefully before writing their answers. All applications will be laid before the management and each applicant will be notified by the 22nd day of May as to whether he is eligible or not for the scholarship examinations.

APPRENTICE RECORD CARD

NAME ______ DATE ______ RATED AS ______ YEAR APP (______) RATE ______

AGE ______ BORN ______

NATIONALITY ______

FILE NUMBER OF DOCUMENTS ______

CHECK No. ______

ADDRESS ______

PREVIOUS SERVICE

STAFF FORMS SUBMITTED

01, 02 AND COPY OF VACC. CERT. ______

07, OR COPY OF REFERENCE ______

03. ______

05. ______

04. ______

06. ______

STAFF ALTERATIONS

2nd YEAR APP ______

3rd " " " ______

4th " " " ______

5th " " " ______

OUT OF TIME ______

RECORD OF SERVICE AT ANGUS

For Progress Report see other side

Fig. 21A.—Front Apprentice Record Card.

1 Write yourname in full (no initials)............

2 Your age last birthday ....

3 Month and year you were born........................

SIGNATURE ....

REPORT OF PROGRESS

NATURE OF WORK	FROM	TO

RECORD OF TIME LOST

Fig. 21B.—Back Front Apprentice Record Card.

4 To what trade are you bound ?.....................

5 What month and year were you made an apprentice under the above company ?.........

6 What is your rate of pay per hour ?..............

7 Are you a cigarette smoker ?.........................

8 Which shop are you working in ?....................

9 What is your present clock and number ?......

10 What classes have you attended at the Angus Works evening classes ?.....................

After you have filled in this form return it before the 15th of May, either to Mr. Maxwell or Mr. Vezina.

MARTIN GOWER,
Supervisor of Apprentices.

Those applying to write on these scholarship examinations must have a good character sheet. This is based on the year's work and forms a sort of curve such as is shown in accompanying illustration.

Samples of Examinations.

To give some idea of the scope of the classes, herewith is the Vice-President's Examination in Electrical Engineering for season 1908-9.

Students sitting for elementary examinations may send in answers to any of the questions, but no credit will be given to advanced students who send in answers to questions 1, 2, 7, 9, 10, 12.

Vice-President's Sessional Examinations for Evening Classes.

Electrical Engineering.

1 Explain the action of a simple voltaic cell. Give sketch.

2 Name 3 or 4 different kinds of cells, and explain fully the construction of one.

3 Name several kinds of galvanometers used in electrical work, and explain fully the construction of one.

4 A magnet is broken into four pieces. Sketch the pieces and show polarity.

5 What is the E.M.F. if an incandescent lamp has a resistance of 55 ohms., and requires 3.3 amperes ?

6 Write down the law of magnetic attraction and repulsion.

7 Show by means of a sketch the proper way of connecting the voltmeter to the line.

8 If a wire carrying a current from north to south is placed over a needle, how will the needle point ? And why ?

9 Sketch four cells in series and show direction of current. Also sketch four cells in parallel.

10 Show by means of a sketch how an ammeter should be connected in a circuit.

11 An arc lamp taking 10 lamps at 50 volts is connected across a 110 volt line with a regulating resistance in series with the lamp. How many ohms must this resistance be ?

12 What is the difference between a permanent magnet and an electro magnet ?

03 Write a brief description of a storage battery.

14 How many electric h.p. are needed to drive a dynamo supplying 120 sixteen candle power lamps, if the lamps take half an amp. each, and are supplied with 120 volts each ?

15 Write a brief description of the Cooper-Hewett Mercury Lamp and also of the Flaming Arc Lamp, and state which you would prefer to instal in a machine and loco. shop, the dimensions of the building being 500 ft. long by 50 ft. wide, the height of the traveling cranes from the ground being 30 ft.

16 Give a brief description of a Weston Indicating Wattmeter, and show connections. What is a multiplier, and how would you connect it in a circuit ?

17 The distance between a generator and motor driven by it is 600 ft. The line is number 0. If motor requires 200 amperes what is the voltage lost in the line ? If generator voltage is 250, what will it be at motor ? (No. 0 wire has a resistance of 1 10 ohm to 1,000 ft.)

18 A conductor in the form of a loop is moved across a magnetic field so as to cut the lines of force. Show by means of a sketch the direction of the induced current.

19 What is the essential difference between an A.C. and a D.C. generator ? Explain the action of commutation in the latter.

Form M.P. 101

Name ______ Date ______ Rated as ______ at ______ Shop

Age ______ Born ______

Nationality ______

Married or Single ______

Fyle No. of Documents ______

Check No. ______

Address ______

PREVIOUS SERVICE.

STAFF FORMS SUBMITTED.

01, 02 and copy of vacc. cert. ______

07, or copies of references ______

03, ______

05, ______

RECORD OF SERVICE

(10-10 08. 2016)

Fig. 22.—Apprenticeship Record Card.

20 Name the chief parts in a D.C. generator and the use of each. In what two ways could the voltage of generator be increased under running conditions?

An example of sessional examination for evening classes is as follows:—

Vice-President's Sessional Examinations for Evening Classes.

Arithmetic and Mensuration.

1 Find the weight of a sheet of iron 6¼ ft. long, 3 ft. 4'' wide, and ⅛'' thick. (1 cu. ft. of iron weighs 480 lbs.)

2 A cistern has 5 water taps. The first will fill it in 1 hour, the second in 2 hours, the third in 3 hours, the fourth in 4 hours and the fifth in 5 hours. In what time will the cistern be filled when all taps are running at once.

3 A machinist apprentice can turn 20 large bolts in 3-5 of a working day. Another can turn the same number of bolts in ⅘ of a working day. How long will it take the two apprentices working together to tusn out the 20 bolts. (Length of working day is 9 hours.)

4 How many round bars of iron are there in a triangular pile 49 bars at the base and 1 at the top.

Fig. 24.—Scholarship Apprentices.

5 How many sq. ft. are there in a board 20 ft long, 9'' wide at one end, and 11'' at the other.

6 Three air brake cylinders are the same length. Two are 10'' in diameter and the third, 15'' in diameter. Will the 15'' cylinder have a greater or a lesser capacity than the other two combined. Compare areas and show working.

7 What would be the pressure on the piston of a 10'' brake cylinder of a passenger coach in an emergency stop with a quick action valve, if the cylinder pressure is considered as 60 lbs. per sq. in.?

8 An apprentice planing wedges cuts ½'' stock wedge. If the surface measures 5½ x 9½, what is the weight of cast iron cut from 50 wedges.

9 A 38 ft. tank car has a tank 30'' in diameter and 33 ft. long. What is its capacity in gallons.

10 Add together. 7⅞'', 1 ft. 1 5-16'', 23¾''.

11 Explain what is meant by the terms mixed fractions, proper, and improper fractions. Give examples.

12 Substract 8 15-16'' from 1 ft. 8 3-32''.

13 The numerator of the fraction is 28. The value of the fraction is ⅞''. What is the denominator.

14 An iron plate is divided into four sections. The first contains 29¾ sq. in., the second, 50⅝ sq. in., and the third, 41 sq. in. The plate contains 190 9-16 sq. in. How many sq. inches are there in the fourth section.

15 The foremen of the north and south machine shops are paid $1,200 per annum. The Supt. of the shops offers them an increase in wages of $5 every half year or six months. The foreman of the north machine shop accepts this offer, but the foreman of the south machine shop objects, as he says it is too small, so the Supt. of shops gives him $20 per annum increase. Which is the best offer, and why. Show how much each foreman will receive in four years.

16 Explain the quick way of squaring numbers ending in ½ or ¼. Use the following examples:—(9½)2 and (6¼)2. Show your methods.

17 Multiply 234 by 254 in one line. Explain the principle.

18 Simplify. 2 23-32 x 9½—1-:- (3½ x 14⅛—5⅝.)

19 Reduce 1 ton, 4 cwt., 37 lbs., 8 oz. to a decimal of a ton.

The certificate of apprenticeship received at the end of a course is shown in the accompanying illustration.

FORM 613

Canadian Pacific Railway Company

Motive Power Department

Certificate of Apprenticeship

No. *190*

This is to certify that

has served *years, and* *months*

from *to*

as a *apprentice,*

during which time he passed through the

His attendance was *and conduct*

Special mention

Officer in charge of shops. *Head of Department.*

Fig. 23.—Apprenticeship Instruction Card.

Some Results of the System.

One economy that has so far resulted from this system is that there is less spoiled work, and the boys can use their knowledge of drawing to a great advan-

tage. This is shown in their greatly increased ability to read the shop blueprints. Many dollars are saved for the company through this ability, both in speed and elimination of spoiled work on account of misinterpretation of a blueprint.

The effect upon the apprentices is an enthusiastic endeavor to do better, which, of course, increases his skill and incidentially his output, increasing his value to the company.

It might be assumed that the rank and file of the men would be inclined to resent this innovation which so increases the efficiency of the apprentice. The opposite is the case, however, and they look with favor on the plan which will enable their sons to become skilled mechanics.

Here it may be mentioned that the company puts a great deal of emphasis upon the fact that they are endeavoring to turn out skilled mechanics, rather than superintendents, draftsmen, etc. The fallacy of many another elaborate system is the fact that they instil into the boys' minds the idea that they are on the way to the "super's" desk or that they will soon take charge of the road. The C.P.R.'s instructors combat that idea hard, wherever it shows the slightest tendency to appear.

Fig. 25.—Apprentices, Angus Shops.

The liability of prejudice among the older men is overcome by the organization of the evening classes spoken of later. Besides the instruction received these classes result in closer intimacy between men and officers and the shop organization.

The accompanying photo of the scholarship class of 1909, shows 9 apprentices representing the following shops:—Toolmaking, machinist, electrician, brass finishing, boiler making and coach carpenter. The picture also gives a good idea of the fine class of young fellows that the system is developing. The large group contains 171 apprentices and there are a good may absentees on account of vacations and other causes. This is the largest railroad apprentice group on this continent, and reflects great credit on the company.

The accompanying photo of the instructors shows the men who are carrying on this excellent work.

The system is attracting a better class of boys, and as a result the standard of the shops is being automatically raised. Parents are beginning to waken up to the fact that it is possible for their sons to receive a technical training while they are making a livelihood. A very large number of applications for apprentices for all trades have been received since the system's inaugauration. This speaks well for the attractiveness of the work, and the appreciation that has been shown in the work thus far established.

It might be said here that the company is a little reticent about prognosticating future results, but there can be only one outcome for a system laid down on such rational far-seeing lines, as is this one, and that outcome will, in all probability, be success.

Fig. 27.—Mr. Gower and His Assistants..

Top Row, Left to Right—L. Francisco, Shop Instructor; A. H. Kendall, Educational Instructor; H. Maxwell, Educational Instructor; C. G. Carey, Shop Instructor; G. Macdermot, Educational Instructor; H. Vezina, Educational Instructor.

Bottom Row, Left to Right—T. Pemberton, Shop Instructor; H. Tetlaw, Educational Instructor; S. A. Gidlow, Ambulance Secretary; H. M. Gower, Supervisor of Apprentices; J. W. Wood, Shop Instructor; T. Pattinson, Shop Instructor; D. L. Davis, Educational Instructor.

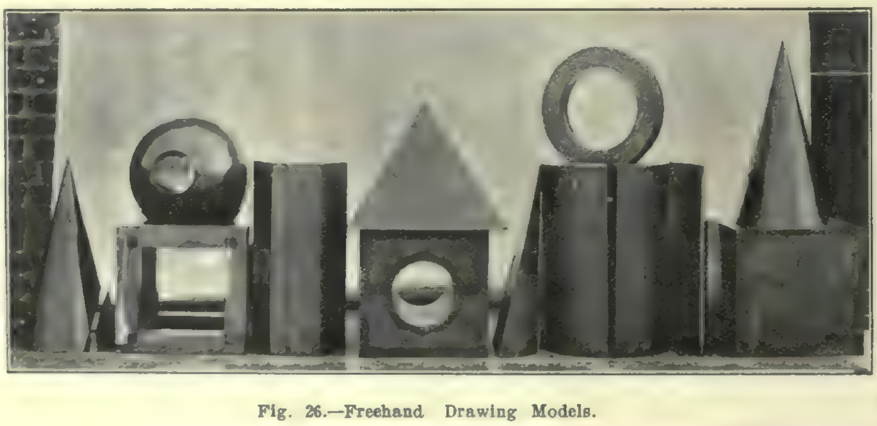


Fig. 26.—Freehand Drawing Models.

Some Examples of Practical Results.

The efficiency of the apprentice under the new system has been increased beyond all estimation. The quality of the output of work is excellent and in many

cases the output itself of the apprentice equals that of the skilled journeyman. Because of lack of space only a few of the many cases quoted by Mr. Martin Gower are mentioned. The following cases are excellent work and worthy of special mention.

Fig. 28.—Models for Mechanical Drawing.

A third year cabinet makers' apprentice is able to polish the inside of a first-class car, such as the veneer partitions, work which is generally undertaken by a skilled journeyman.

A tinsmith apprentise marked off and made, without assistance, some of the copper domes on the Company's new observation cars.

A third year upholsterer apprentice is capable of upholstering completely, a sleeper or a parlor car seat.

A third year car builder apprentice was selected to work on a carpentering gang, which usually consists of four men, having charge of the erection of the frame of the car and the outside finish.

A third year machinist apprentice, during the absence of the regular mechanic was able with the assistance of a younger apprentice to undertake the regular head-light repair work.

A second year machinist apprentice is capable of running a large vertical miller in the machine shops and turning out the motion work, under the piece-work system. This machine was formerly run by skilled journeymen.

A double headed frame stay slotter, usually handled by two mechanics is now run by a mechanic and one third year apprentice, without affecting the output of the work.

A third year machinist apprentice is capable of running a wheel quartering machine by himself.

Several third year machinist apprentices are able to fit up eccentrics, cross heads, pistons, and axle boxes from blue-prints.

A second year electrical apprentice is responsible for a great deal of the are light work about the Angus shops, while a fourth year boy has entire charge of the installation and maintenance of the shops' telephone system.

Among the work taken charge of by fourth year machinist apprentices is that of squaring the locomotive frames and putting up the shoes and wedges, also the fitting and applying of new cylinders. Of course, in this heavy work the apprentice is assisted by laborers and helpers but he is the one in charge and upon whom the responsibility of the work rests.

The intricate Walschert valve gear is also set up in many cases by fourth year machinist apprentices.

Apprentice Association.

About the same time that the apprentice system was inaugurated, Mr. Martin Gower started the ball rolling towards the formation of an association, which would tend to promote esprit de corps among the boys. That this latter object might be accomplished it was necessary to make some arrangement, whereby the apprentices from the car shops could become acquainted with those from the steamfitters' department in the locomotive shops, etc.

The idea was taken up by the apprentices with a degree of enthusiasm, which has increased as the scope of the association become larger. The officers of the "Association of Canadian Pacific Railway Apprentices" are chosen from among the boys and those for the ensuing season are: G. W. Musgrove, Pres. (machinist apprentice); H. C. Harragin, Secy. (air brake apprentice); E. Storey, Treas. (machinist apprentice).

CANADIAN PACIFIC RAILWAY

APPRENTICE DEPARTMENT

MONTHLY SHOP REPORT OF LOCO. APPRENTICES

ANGUS WORKS

West Machine Shop Month of September

Name of Apprentice		Work according to Schedule	Commenced	Progress
Graves	1	Milling Mac	Sept 1st	S.&P.
A. Walsh	1	Surface Table	Sept 1st	S&P.
J. Harvey	1	Small. Shaper	Aug 1st	S.&P.
A. Morris	1	Double Shaper	Sept 1st	S&P.
C. Clarke	1	Brass Shaper	Aug 16th	S.&P.
H. Yearsley	1	Small Shaper	Sep 1st	S.&P.
F. Barefoot	1	Small Shaper	Sept 1st	S.&P.
A. Coleman	1	Large Shaper	July 21st	M.
J. Winder	1	Valve Bench	Sept 1st	M.
A. Fullerton	1	Small Shaper	July 21st	M.
J. Dillon	1	Main Rods	Sept 24th	M.
E. Day	2	Main Rods	April 1st	G.
L. Lamothe	1	Milling Mac	July 21st	G.
L. M. C. Marcil	1	Main Rod	May 11th	M.
A. Narbonne	1	Side Rod	Sep 20th	G.

W. Soway
Shop Foreman.

William Walsh
Loco. Shops Apprentice Instructor.

Supt. of Loco. Shops.

This form to be filled in and sent to the Supervisor of Apprentices on the 1st of the month.

Fig. 29.—Monthly Shop Report.

The crest of the association is shown at the bottom of the large group photograph. It was designed and drawn by two of the boys themselves and submitted to the executive council. The crest embodies the company's beaver and shield and shows symbols of the work and play of the boys; a micrometer, calipers and square representing work, and a lacrosse stick, hockey stick and football standing for play.

Soon after the inauguration of the association the boys decided to hold regular monthly business meetings, and at these meetings either invite some official of the company to deliver an address or have one of their own number read a paper. The first address was given by Mr. Lacey R. Johnson, on "The C.P.R. in The West," which was made interesting to the boys by aid of lantern slides. This coming winter's program has already down on it several addresses by different well-known men, as well as promised papers on valves, etc., by members.

Another strong feature of the association is the development of good feeling among the apprentices through the agency of good healthy games and recreation. A football team was almost immediately organized by Mr. Martin Gower, who is deeply interested in athletics and a firm believer in the effect they have on the the young man morally, mentally and physically. A little difficulty was experienced on account of the novelty of the game, but at present there is material for four teams, and through the last season there were usually two teams pitted against other Montreal teams, every Saturday afternoon. The first eleven played about fifteen games, only losing one, and tieing two. A Harrier Club has also been formed, and several of the apprentices have made very good showings at the various athletic meetings in and around Montreal. Two teams have been entered in the Montreal water-polo league, playing against such teams as McGill, Montreal and Y.M.C.A.

Fig. 30.—Character Examination.

Arrangements are being made to form a hockey and skating club in connection with the association, and it is planned to have a rink built close to the shops where matches can be played. The rink will be oval in shape, 150' x 100' with a 20-ft. pleasure skating space outside of this.

All the games are played on ground adjacent to the shop, which the company have, at their own expense, drained, leveled and fenced in.

The association of apprentices is managed entirely by themselves, the Supervisor contending that boys of 19 years of age and upwards and earning good wages are as thoroughly capable of running such an association as are university men. This work teaches them to be independent and think for themselves, brings them together and gives them good experience in organization and executive work.

Evening Classes.

When the boys have served their time, the company still makes it interesting to them to continue their educational work and evening classes are held from October to April inclusive. These classes are for those that have served their time and

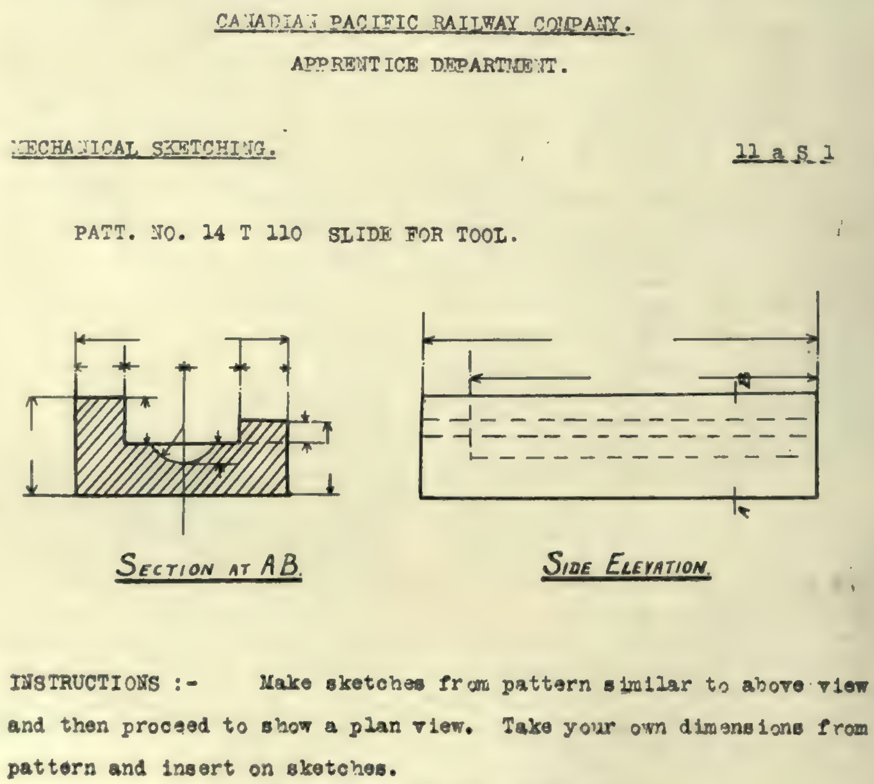


Fig. 31.—Mechanical Drawing Lesson Sheet.

any other employees who want to attend. These classes are under the management of Mr. Martin Gower and usually consist of blackboard lectures and individual instruction on one or other of the following subjects:—

(1) Geometry and workshop drawing for locomotive machinists. (2) Arithmetic and mensuration for all grades. (3) Forge shop work for blacksmiths. (4) Carpentry and joinery drawing for carmen. (5) Lectures on locomotive boilers, engines and air brakes. (6) Electrical course for electricians. (7) Shop mechanics for all grades.

Those attending these classes are encouraged to ask questions and promote discussion on the subject of the evening, and that they are popular is shown by the attendance last winter when there were 260 enrolled. Examinations are held at the end of the session and prizes awarded.

The syllabus for the season of 1909-1910 is as follows:—

Locomotive Shop Practice.—Instructor, Mr. A. H. Kendall, foreman, locomotive erecting shop.

Electrical Engineering. — Instructor, Mr. Guy McDermot, construction foreman, electrical department.

Mechanical Drawing.—Instructor, Mr. D. L. Davies, electrical and motive power draftsman.

Car Drawing.—Instructor, Mr. M. H. Vezina, carshops apprentice instructor.

Mathematics. — Instructor, Mr. H. Maxwell, educational instructor.

Iron and Steel.—Instructor, Mr. E. B. Tilt, assistant engineer of tests.

The upkeep of these classes is divided between the company and the Educational Department of the Province of Quebec. The latter allots an appropriation every year, covering the salaries of the instructors.

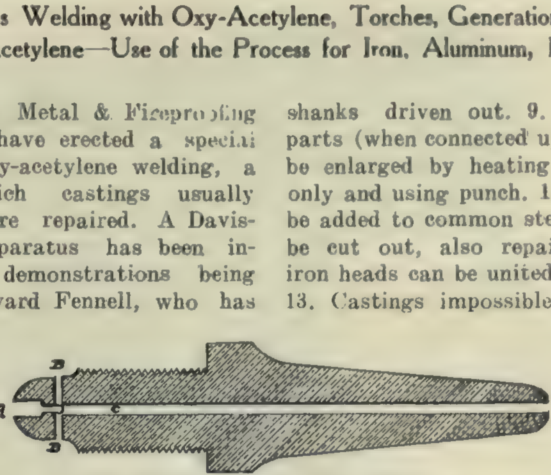
As the classes take place immediately after work, the company supplies a good substantial meal to those men who take the classes. This meal is free and there is no charge made for the building, light or heat. The company also furnishes absolutely everything connected with the classes, such as pencils, drawing instruments, paper and other materials. This is in contrast to other systems in vogue on other railroad systems, but the C.P.R. thinks that the man who has a large family perhaps, or other cares that give him no excess money for outside things should have the same chance for advancement as the more fortunate man who has less calls on his pay envelope. This education then does not cost the men one single cent.

Photographs were taken by the Canadian Photographic Co., Montreal.

Davis-Bournonville Process of Welding and Cutting

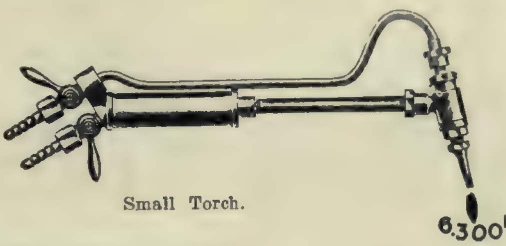
Autogenous Welding with Oxy-Acetylene, Torches, Generation of Oxygen and Acetylene—Use of the Process for Iron, Aluminum, Brass, etc.

The Expanded Metal & Fireproofing Co., Toronto, have erected a special building for oxy-acetylene welding, a process by which castings usually thrown away, are repaired. A Davis-Bournonville apparatus has been installed, daily demonstrations being given by J. Edward Fennell, who has charge of the oxy-acetylene welding department. A broken gasolene engine cylinder was repaired with the greatest ease. In repairing the broken cylinder it was first heated to red heat in a preheater so that the casting would not crack when repaired.



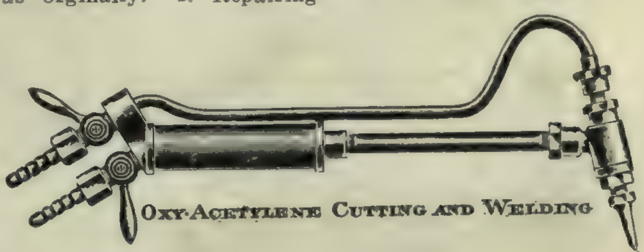
Oxy-Acetylene Interchangeable Nozzle Tip.

The following is a partial list of the applications of the process of oxy-acetylene welding and cutting:



Small Torch.

1. Reclaiming light and heavy castings coming from the sand with blow holes, sand holes, cold shuts, lugs off, etc. 2. Reclaiming light or heavy cracked or broken castings, whether of cast iron, cast steel, brass or aluminum. 3. Adding metal to parts subjected to friction, making such part as serviceable as orginally. 4. Repairing small or large boilers in place, welding in new parts or filling in cracks edge to edge. 5. Split piping of all kinds can be quickly welded when in place usually without breaking connections. 6. Welding flanges on pipes. 7. Pipe manifolds or connections or intricate forms can be made. 8. Rivet heads quickly cut off and shanks driven out. 9. Holes in metal parts (when connected up) can frequently be enlarged by heating with the torch only and using punch. 10. Tool steel can be added to common steel. 11. Dies can be cut out, also repaired. 12. Cast iron heads can be united to valve stems. 13. Castings impossible or difficult to mould can be made in parts and united. 14. Many joints which never need be broken can be welded instead of bolted, and compactness, lightness and greater strength secured. 15. Imperfect steel castings of all kinds can be reclaimed. The percentage of imperfections in these is greater than in any other class of castings. 16. Shafting, etc., cut too short can be extended. 17. Bridges, boilers, arches, steamships, can be wrecked by the cutting process. 18. Wearing qualities may require steel in certain places while wrought or cast iron will afford the requisite strength for the bulk of the supporting body. 19. Bolt and other holes worn beyond use can be restored to former size, etc. 20. Holes drilled in error can be filled in, dressed down and not discernable. 21. Small metal parts broken off or missing can be added. 22. The shape of patterns can sometimes be modified, also metal added. 23. Main frames can frequently be welded in place without stripping. 24. Steel rails can be bond-



Larger Oxy-Acetylene Torch.

ed with copper, also welded end to end. 25. Teeth broken from gear wheels can be renewed. 26. Steel or wrought iron to the thickness of 5 or 6 inches can be cut, the kerf about $\frac{1}{8}$ to $\frac{1}{4}$ inches in width. 27. All kinds of metal fluid and liquid containers can be made without joints and less liable to leak when bruised or dented, also defective parts can be cut out and replaced with a perfect sheet, the same shape and welded into position edge to edge. 28. Joining of steel parts for reinforcing concrete.

Heavy Casting Welded; Note Added Metal.

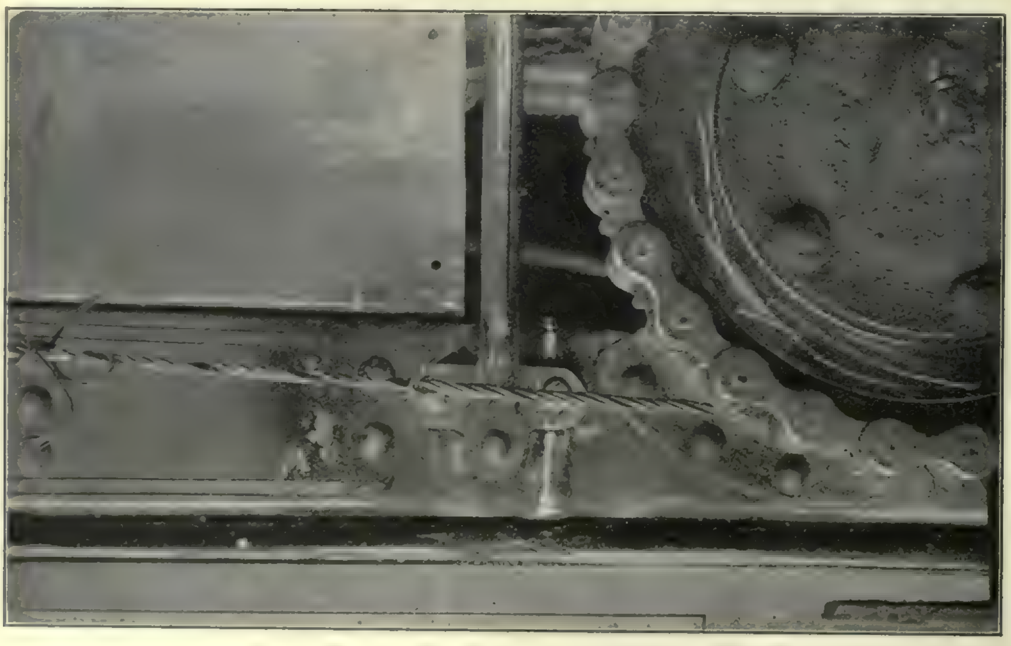
Welding Apparatus.

The "torch" consists of an upper tube carrying oxygen at a pressure varying from 5 to 25 pounds as required, leading into a mixing chamber into which is introduced a lower pipe carrying acetylene at a pressure of one pound. Into the mixing chamber may be screwed a variety of different nozzles having a lengthwise hole, in its passage through which the jet of high-pressure oxygen draws in the acetylene through radial holes around the sides of the nozzle. The proportion of the area of the holes in the nozzle sufficiently regulates the proportionate mixture of the gases, but the latter may be further controlled by cocks upon either pipe. The acetylene pipe is also provided with an enlarged chamber filled with porous material which prevents any danger of flash-back of the flame into the acetylene supply pipe, and also serves as a handle for the torch.

The acetylene being under pressure, however, the flame is not dependent upon injection for its acetylene supply, and the torch as above described is all that is required for welding. The two pieces of metal to be welded, with no flux or special preparation whatsoever, are simply laid with the edges to be welded together, the jet of flame from the torch is passed along the joint, and the intensely high local temperature generated causes the metals to flow together, and the weld is complete. In most cases it is advisable to add a little of the same metal from a wire or stick carried in the other hand, and introduced momentarily into the flame, as required when it drips off, just as one drops sealing wax onto an envelope.

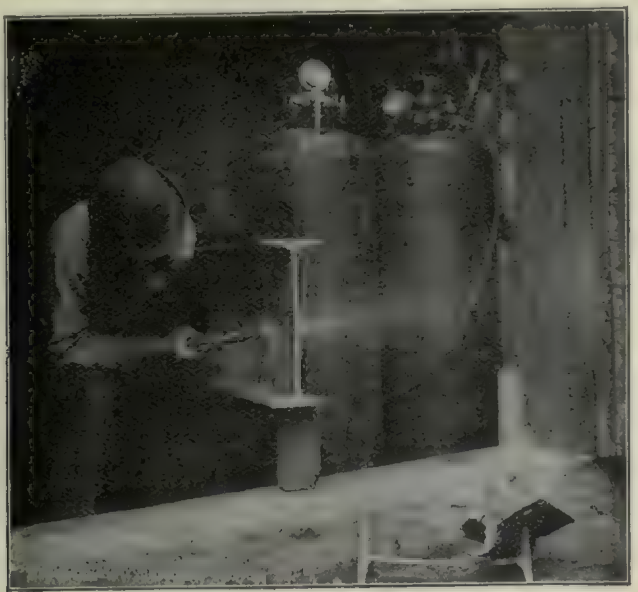
Gas Generation.

Acetylene is generated in a Davis pressure generator, which is a "carbide feed." Lumps of carbide are dropped into a large volume of water, a gallon of water being used to every pound of carbide. A "carbide feed" generator prevents excessive heat.



Auto Truck Frame Welded Without Stripping.

Oxygen is generated in the Davis-Bournonville process by chlorate of potash and manganese-dioxide, and is passed through caustic soda to cleanse it.



Cutting 15" I-Beam in Less than Three Minutes.

It is then pumped from the receiver into pressure cylinders.

Welding.

Reference has been made to the many applications of oxy-acetylene welding. The welding is done without materially changing the composition. Cast iron, brass, aluminum, steel, etc., are easily welded. In fact welding cast iron is really the most satisfactory, as the metal becomes sufficiently fluid to leave a smooth surface.

Possibly the most radical development which this process has produced is the satisfactory welding of aluminum. This has long defied all attempts to unite it in a manner that would withstand a strain anything like the metal itself. It is due to the reducing nature of the flame, which is not sufficient to cause the metal to flow together. The actual uniting is produced by puddling the molten metal with a steel rod, which effectually breaks up any coating of oxide.

Cutting With Oxy-acetylene.

Steel and iron can be cut with great facility. The operation is performed by heating the metal at the first point of contact to the red, by the ordinary welding flame, and with this flame continued a jet of pure oxygen is turned on which unites with the carbon of the metal and disintegrates it with surprising rapidity. The cut is narrow and smooth, with no material injury by oxidation. The cut can be made in any shape, and the process will be found very useful in cutting irregular forms, and will be valuable especially in making many kinds of dies and in fitting steel plates. It is especially effective for cutting steel beams in structural work, steel arches, large steel beams, steel boilers, steel piling, shaped deck plates for steamships, and will cut the hardest steel for vaults and other purposes.

NATIONAL MACHINE TOOL BUILDERS' CONVENTION.

The eighth annual convention of the National Machine Tool Builders' Association was held at Hotel Astor, New York City, October 12 and 13. One of the matters of greatest importance was the presentation of electric motors as applied to machine tools.

The first question asked was: If all the manufacturers of motors were to make their base dimensions and other important dimensions alike for a given horse power, would it not be beneficial to all? The question brought the unanimous answer of "Yes."

No definite action was taken except that the committee will work along this line. The motor manufacturers of the United States will meet in November, when it is hoped that some definite action will be taken. As it is at present there is a diversity of opinion on some points, as, for instance, the maximum speed of motors, both constant and variable. The majority favored 1,200 r.p.m., at least on small motors up to 5 horse power. There was a difference ranging from 900 to 1,800 r.p.m. Where rawhide pinion is used it was found that the maximum speed was somewhat higher, but that still 1,200 r.p.m. was most commonly used. With metal pinion this was somewhat lower.

Another subject discussed was the creation of machinists, from the standpoints of education and payment. Best results were obtained in one shop by advancing the wages from 15 to 17½, 20 22½ and 25 cents, as the young men became more acquainted with the work. They were taught by a first-class machinist, and by exercising great care, machinists were created in a short period of time. There must be mutual care, however, both by the company and the young man who wishes to advance. Other methods were also discussed.

A. S. M. E. MEETINGS.

On November 9, papers on Reinforced Concrete Beams and Stresses in Curved Machine Members will be read before the American Society of Mechanical Engineers, 29 West 39th Street, New York. The annual meeting will be held December 7 to 10. The secretary is Calvin W. Rice, United Engineering Bldg., New York City.

STEEL CORPORATION AT COAST.

It is beginning to look as if British Columbia is to have a steel industry. G. M. Gibbs and G. S. Faulkner, of Vancouver, have had a conference with Jas. A. Moore, who is head of the Irondale Steel Co., Irondale, Wash., and H. E Law, of San Francisco, who is also largely interested. The result is the formation of the Western Steel Corporation, with a capital of $20,000,000, and headquarters at Seattle. The new company will take over the Irondale works and intend to start operations shortly in British Columbia. In that province there are known deposits of iron, assaying 66 per cent., and within easy reach of tide-water one large deposit being right on the sea.

QUEBEC BRIDGE PLANS READY.

Tenders for two types of bridge, cantilever and suspension, will be called for shortly by the Quebec Bridge Commission. The plans of the new bridge call for a structure 150 feet above high tide for at least 600 feet of its mid-river length. It will also be 24 feet wider than the old structure, the total width called for being 85 feet. A new pier is to be built 100 feet further from the north shore than the present pier, thus reducing the length of the centre span to 1,715 feet. Work will in all likelihood be commenced next spring. The plans are now ready.

MACHINE SHOP METHODS AND DEVICES

Unique Ways of Doing Things in the Machine Shop. Readers' Opinions Concerning Shop Practice. Data for Machinists. Contributions paid for.

TOOL HOLDER.

By MacK.

Our keyseater, a nearly new machine of a standard make, would never take a big enough chip to suit the boss. The cutters are inserted in the bar and are expensive to buy and drill easily. Figs. 1 and 2 show the cutter. They were held by a set screw in the centre of the lower bar shown in Fig. 3.

The cutter used now and giving bet-

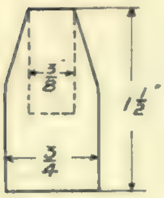


Fig. 1.

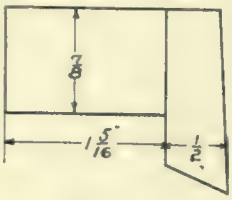


Fig. 2

ter satisfaction is a piece of high speed steel, ground to micrometer and fitted tight in the squared opening in the lower bar Fig. 4, and having a taper pin, 5 inches, flattened in one side, drawn across the top of the cutter, and including ⅝ inch in size. The new cutters can be made by the dozen for the price of one of the old style. They cut faster, do not dig in, and wear longer. After a trial of the cutter, three sizes were put in each bar. Above ⅝ in size we upset square steel in a die and grind to size.

DESIGNING CHEAP HANGERS.

By Arthur Jacques.

Some time ago the writer had occasion to design a cheap overhead motion for a certain machine, of which large quantities were being made. This overhead

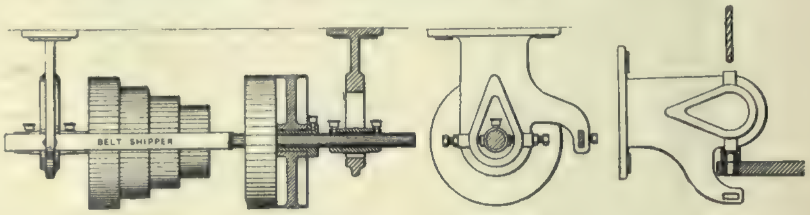


Fig. 1.—Designing Cheap Hangers.—Fig. 2.

motion is also suitable for any other class of machinery, such as lathes, drilling machines, milling machines, etc.

The ordinary type of hanger with a brass step at the bottom, about 1½ diameters long, being too expensive to make, we decided to have our hangers made with a long solid cast-iron bearing four diameters long, each bearing ta be greased with Stauffer lubricators, and to be held in position by the ends of screws so as to allow the bearings to swivel. Fig. 1 shows the hanger as adopted. These hangers we now make in three sizes to fit 1¼, 1½, and 1¾in. shafting, each size having a different depth.

The only machine work on each hanger is drilling the holes for the ⅜in. screws which hold the bearing in position. These holes are drilled and tapped in an ordinary drill press, with a reverse drive. The bottom boss is put in a cone or female centre, and is held there by the operator, as shown in Fig. 2, while both holes are drilled and tapped. We have broken no taps yet, though we use ordinary pulley taps fitted in a "Little Giant" drill chuck. The drill press is reversed by a treadle connected to the shipper.

The shaft for an overhead motion is generally forged with a collar at the end. This requires turning up, and as this was out of the question, we decided to use a solid-drawn steel shaft with a steel collar driven on and pinned in position. These collars are easily made in a turret lathe, and are drilled with a D size drill, ¼in. wire being a nice driving fit into the hole; the end of the pin is filed level.

The ordinary collars are also made in a turret lathe from bright steel, and are drilled and tapped in a drill press, being driven on a stick and put on a V-centre. The cone pulley and fast and loose pulleys are made in the usual way, but the loose pulley revolves on a sleeve fastened with a grub screw to the shaft, the sleeve being greased by a Stauffer lubri-

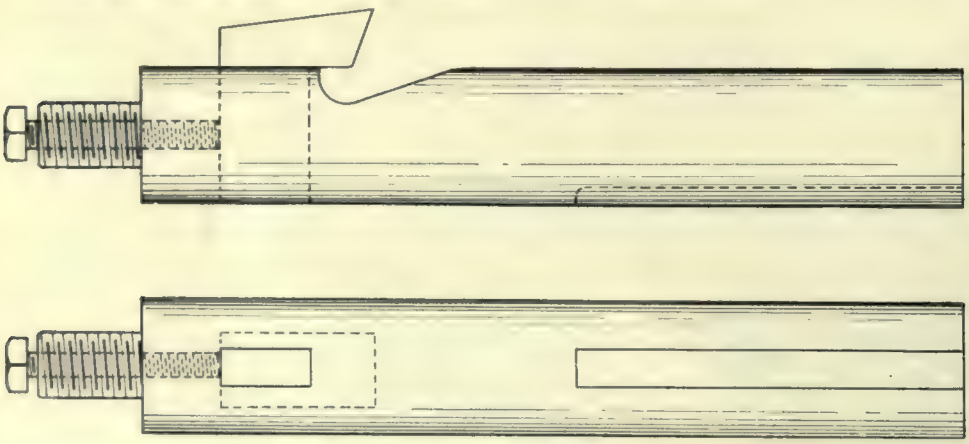


Fig. 3.—Tool Holder.

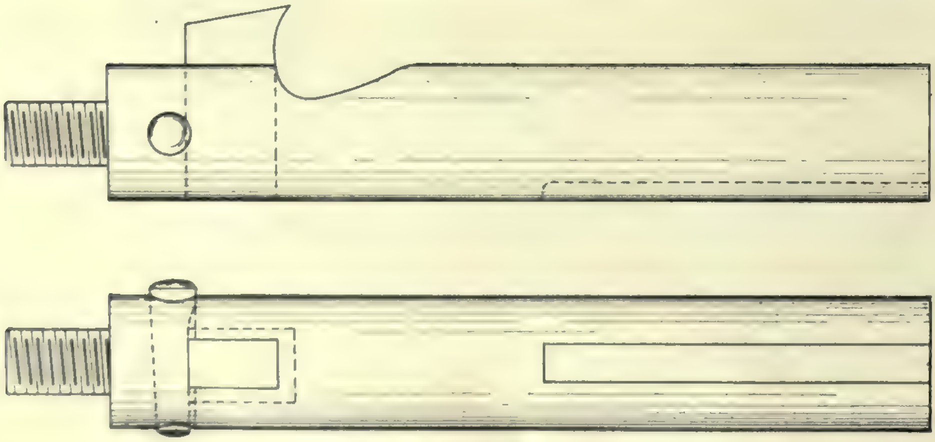


Fig. 4.—Tool Holder.

cator. This we find a great improvement upon the usual method of having the loose pulley revolving on the shaft and oiled by an oilhole. This oilhole is hardly ever at the top when the pulley is oiled; consequently, only the ends are oiled, and when the machinery starts, all the oil is thrown either on the machine or operator.

The sleeves are made from cast iron, are bored to fit on the shaft and then turned for the pulley, and drilled and tapped for the lubricator. The bearings for the shaft are bored in a boring lathe, then reamered out, and the ends faced up.

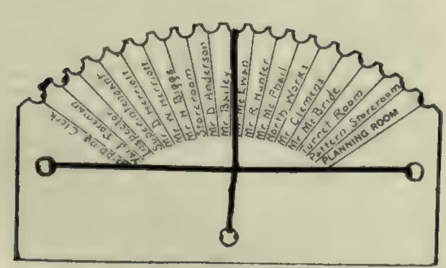
The holes where the screws fit, which hold the bearings in the hangers, are drilled about ½in. deep, and ⅝in. diameter. The casting has a boss on each side, and if the holes are drilled in the centre of these bosses they are true enough. We have tried jigging them, but it was too much trouble.

The bearing is then slotted with a round slot for the grease, and drilled and tapped for lubricators, one on each side. The writer has personally fitted up several dozens of these overhead motions, and no trouble has been experienced as regards either the bearings heating or wearing out of parallel. They are fitted up in half the time taken with the old-fashioned brass bearing hanger.—Mechanical World.

INTER-FACTORY MAIL DELIVERY.

By G. Campbell.

The accompanying illustration shows a very convenient device used in the works of Goldie & McCulloch, Galt, for the transmission of mail or parcels among the various departments. The device consists of a cardboard, one side colored red and the other green. The green side is here shown and on that side is printed the names of the various



Card to Facilitate Delivery of Mail Among Various Departments.

departments of the works. On the red side is printed the names of the men in the office.

Two elastic bands, as shown, are used on each card. The mail is placed in the horizontal band while the vertical band indicates the department or official to whom the mail is to be delivered. In the illustration the elastic is at the name of Mr. Bailey showing that mail is to be delivered to him.

A delivery boy makes regular rounds leaving the mail with proper persons. In order that his work may be facilitated, and to prevent mistakes, two baskets are used, one marked "In" and one "Out." When delivering mail the boy places it in the "In" basket removing that from the "Out" basket, to be delivered to the proper person or department on his next round. The device is found to work very satisfactorily.

MAKING A BLANKING DIE FOR PAIL SECTIONS.

By J. H. R., Hamilton.

The accompanying drawings show the method of developing the template and making the die for a half-section of a five-quart pail body. In Fig. 1 a b c d show the elevation of the pail. Diameter at top=8 ins. Diameter at bottom=6 ins.

To find the volume of the frustum of a core on pyramid:

Rule.—Add the areas of the top and bottom, and the square root of the product of both the areas, and multiply by one-third the altitude.

Or in the form of a formula:

$$\text{Volume} = (a^t + a^b + \sqrt{a^t \times a^b})\ \tfrac{1}{3}\ \text{alt.}$$

One U. S. gallon contains 231 cu. in., 5 qts.=1.25 gallons.

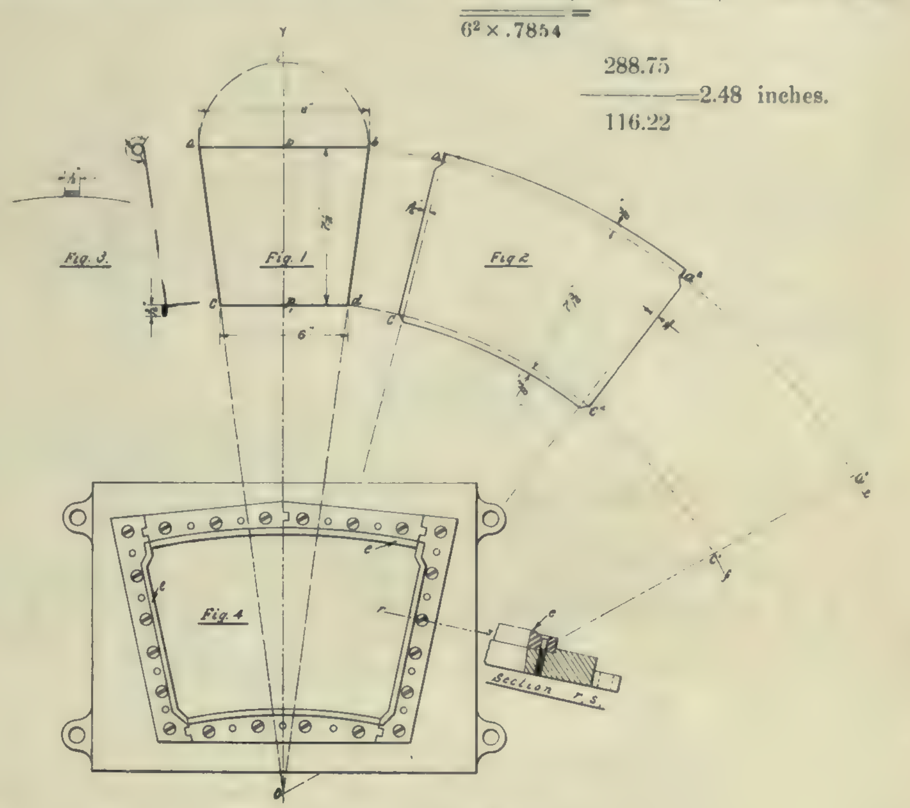
1.25 gallons contains 231×1.25=288.75 cu. in.

Then by the formula:

$$\text{Volume} = (a^t + a^b + \sqrt{a^t \times a^b})\ \tfrac{1}{3}\ \text{alt. or}$$

$$\tfrac{1}{3}\ \text{alt.} = \frac{\text{Volume}}{a^t + a^b + \sqrt{a^t \times a^b}} = \frac{288.75}{(8^2 \times .7854) + (6^2 \times .7854) + \sqrt{8^2 \times .7854 \times 6^2 \times .7854}} =$$

$$\frac{288.75}{116.22} = 2.48 \text{ inches.}$$



Making a Blanking Die.

Therefore altitude = 2.48 × 3 = 7.44 inches, or 7½ inches.

To develop the pattern of the section shown in Fig. 2. Draw the vertical line OY Fig. 1. Through a point p draw the horizontal line a b, having the points a and b 4 inches on each side of the vertical line OY.

From point p lay off the point p, a distance equal to the altitude, or 7.5 inches. Through p, draw a horizontal line, and lay off the points c d, 3 inches on each side of the vertical line OY.

Draw lines from a to c and b to d and produce until they intersect the vertical line at o. With o as a centre and od and ob as radii, describe arcs df and bc. On the arc bc lay off the distance of a a^1 equal to the circumference of the top of the pail=8×3.1416=25.133 inches.

Through a and o a^1 draw the radial lines ao and o a^1 cutting the arc df at c and c^1. Then a a^1 c c^1 is the development of the conical section of the pail. As the bodies of pails are usually made of two or more sections, this development must be divided into two or more sections of equal area and shape, in this case two as shown at a a^2 c c^2.

Fig. 3 shows the allowance made for wiring the top and double seaming the

bottoms, also the side seam. This makes the total depth of pattern=7.5625 nearly +.375+.375=8.3125" or 8 5-16" nearly. For side seaming 3-16" must be added to one edge, and ⅜" to the other edge or 9-32" to each edge. The comers are then notched as shown, so that wheu the pail is made up, the wiring and seaming leaves a smooth, neat appearance.

Fig. 4 shows the method of building up the blanking die for the above pattern. The steel used is 1¾" wide by ⅜" thick. By placing the blank or patteru on a flat surface the various sections of the die can be determined to the best advantage. The several pieces are fitted as shown, with tongue and groove, thus locking them firmly together. The blank is then placed on and the shape marked on the steel, which is then shaped and fitted to size; the surface of the steel is cut away on the outside, leaving a raised edge for grinding as shown at c in the sectional cut, and in Fig. 4.

After drilling for screws and dowls, the pieces are hardened and re-fitted. The bolster plate is then recessed out to a depth of about ¼", so that the pieces fit closely together, and when screwed and dowled make a good servicable die. The punch is built up after the same manner as the die.

LINING, SETTING AND ADJUSTING PLANERS.

By S. J. Kelley.

The first step in erecting a planer is the foundation, which should be 3 or 4 feet deep, according to the weight of the machine, and of brick or stone masonry or concrete. A template should be made to fit the bottom of the planer bed, and with holes for the bolts, which are to hold the planer. The bolts are set at least 24 inches in the foundation, with iron plates 6 inches square below them. Pipe, 2 inches in diameter, fits over the bolts, giving them a little play in order that the planer bed may be set on and the nuts tightened without bending them.

Set the plates, bolts and pipe in position and tighten the nuts so as to hold the template in position, being sure that the planer bed will be in line with the line shaft from which power is to be taken. Put in the foundation and allow it to set for at least 36 hours before placing the planer on the bed. The bed should have wedges about 3 feet apart between it and the foundation when first placed thereon.

Level the bed both across each end, lengthwise and across the corners. When this is done and the machine is in the position desired build a trench entirely [illegible] the machine and ½-in. higher than the bottom. Pour into this trench sufficient fluid concrete or cement and work it well under the sides of the machine. Allow it to set for about thirty-six hours and then tighten the bolts, after which the truth of the bed should be tested again.

The cross-rail is now tested to see if it is true with the ways. Run the rail down to within a foot of the ways and take two turns back in order to eliminate all lost motion. Place a piece of shafting in each of the ways, clamp a tool with a micrometer bar attached in the head and run the bar down so that a piece of tissue paper between it and the shafting will pull. Move the head directly across to the other way without moving the cross rail. If the same conditions hold true the cross rail lines with the ways. If it is not true face off the collar of the screw a little and test again.

If the planer has been used for some time the platen will, no doubt, be peened out of shape. This has a tendency to throw both ends down and the centre up, and makes it impossible to plane a long piece true or straight. Plane off the platen, taking a cut deep enough to remove metal all the way across. The bed will then be found to be low in the centre and high at the ends, having gone back to its natural position. A light cut and then a scrape will correct this trouble and produce a true, level bed.—Southern Machinery.

LARGEST GAS ENGINE IN CANADA.

Technical Education Dept., Halifax, N.S.
Mr. G. C. Keith, B.Sc.,
Man. Editor Canadian Machinery

Dear Sir,—The September number of Canadian Machinery has just come to hand. I wish to call your attention to what I believe to be an error in your article on the Shops of the People's Railway at Moncton, N.B., in which it is stated that they have the largest gas engine in Canada. The writer designed a gas engine plant at Edmonton, Alta., and installed the first unit of 1,000 H.P. twin tandem, Allis Gas Engine. The cylinders are 24" in diameter and 36" stroke, so that you see it is rather under rated. The capacity is more than twice that at the Moncton shops. Credit is due to Alberta, and to myself for the largest installation up to the present time, so far as I know.

Yours very truly,
P. R. KEELY,
Professor of Electrical Engineering.

TORONTO BRANCH A. I. E. E.

The annual meeting of the Toronto branch of the American Institute of Electrical Engineers was held in the rooms of the Engineers' Club of Toronto, on Friday evening, October 15th, when A. J. Soper, of Smith, Kerry & Chace, read a paper on "Transmission Line Calculations." The election of officers for the current year resulted as follows: Chairman, H. W. Price, School of Practical Science; vice-chairman, E. Richards; executive committee, A. L. Mudge, R. J. Clark, H. A. Moore, and F. A. Gaby. W. H. Eisenbeis, of the Canadian Westinghouse Co., 1207 Traders Bank Bldg., is secretary.

PRESIDENT OF SOO INDUSTRY.

T. J. Drummond, Montreal, has been elected president of the Lake Superior Corporation in succession to Charles D. Warren, who has been president for the past five years. The Lake Superior Corporation, is now free of debt and during the coming season the works at the Soo will see the extension of the steel producing plant, blast furnace capacity doubled, erection of structural steel mill, establishment of electric smelting plant, etc.

T. J. DRUMMOND.

THE DOG BIT HIM.

G. D. Clewes, who sells pipe for the Montreal Rolling Mills, is a great lover of dogs, but it got him into trouble the other day at the dog show at the Toronto Exhibition, where he spent the past fortnight in charge of the M.R.M. exhibit.

Showing his affection for the dogs by patting them one by one, he had nearly made the rounds when one hungry pup took a notion to have a meal and closed his jaws on a couple of Clewes' fingers, necessitating a vitist to the exhibition hospital to get the wound cauterized. G. D. says he won't bother going to the Pasteur Institute—says he knew a man who went to the Keeley Institute and then went right back and got bitten again.

DEVELOPMENTS IN MACHINERY

New Machinery for Machine Shop, Foundry, Pattern Shop, Planing Mill; New Engines, Boilers, Electrical Machinery, Transmission Devices.

GARDINER'S AUTOMATIC SAFETY LEVER.

The device shown in the accompanying cuts is the invention of C. M. Gardiner, Montreal, and is designed for use on power presses and similar machines. The fundamental use is in preventing the accidental starting of a power press, while being set up. Another aim nas been to overcome the more or less convulsive movement, when such a machine is started.

FIG. I

Fig. 1.—Lever in Safety Position. To Start a Machine the Slide A, to which is Attached the Pedal C, is Pushed Forward Releasing it From the Locking Device B, the Lever D can then be Pushed Downward. When the Foot is Removed from the Pedal the Lever is Brought Back by the Spring E, and the Slide A is pushed Into the Safety Position by Spring G.

The lever requires a double movement—thought and actions combined—to begin operation. This is accomplished by no loss of time.

Fig. 1 shows the lever in the safety position. To start a machine the slide A, to which is attached the pedal C, is pushed forward, releasing it from the locking device B, the lever D can then be pushed downward. When the foot is removed from the pedal the lever is brought back to the spring E, and the slide A is pushed into the safety position by spring G.

In Fig. 2 the lever is in the down position and shows the lock clearly. In some factories the foot lever has been done away with to some extent and hand levers are used, the device being applicable to this method of starting and stopping also. The lever is so constructed that is is adaptable to use in shifting belts or clutches, etc.

FIG. 2

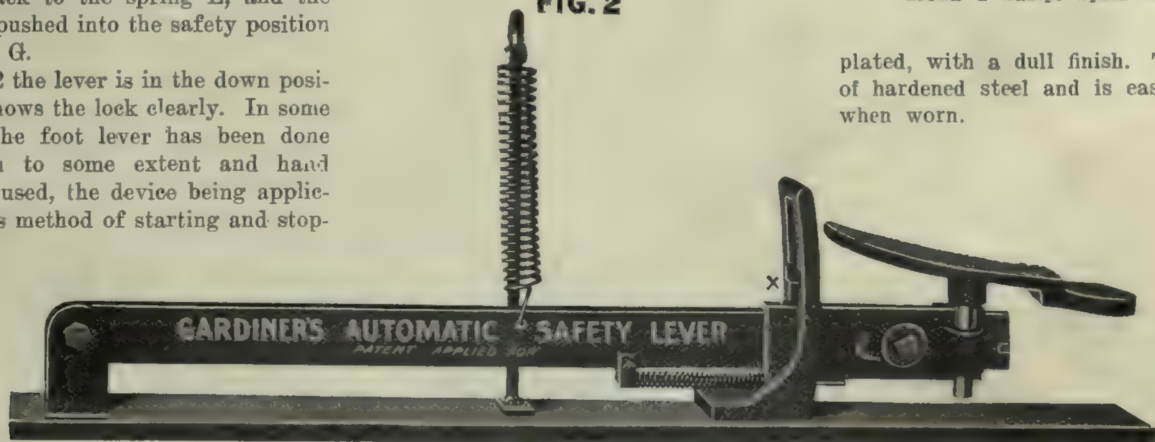


Fig 2.—Lever in Down Position and Showing the Lock Clearly. In Some Factories the Foot Lever has been Done Away with to Some extent and Hand Levers are Used, the Device is Applicable to this Method of Starting and Stopping Also. In Fact this Device can be Used to Shift Belts, Clutches or Anything Similar.

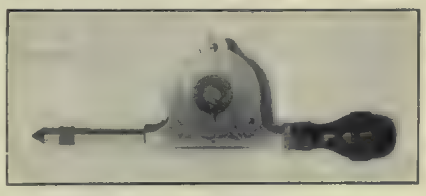
The device is manufactured in Canada exclusively by the Crescent Machine Co., Ltd., 15 Dalhousie Street, Montreal.

SPEED INDICATOR.

The B. & S. Speed Indicator registers on either side, a distinct feature. One side is used for ascertaining the velocity of shafts and spindles running in one direction ; the other side for determining the speed of shafts and spindles running in the opposite direction. Confusion and errors that arise where all readings are taken from one dial are thus avoided. The indicator registers revolutions in units, tens and hundreds.

A small knurled wheel on the side of the case provides for quickly readjusting the tools after a reading has been taken. This wheel when turned reverts the disk that indexes 100 back to the starting point, a most desirable feature where a series of readings is to be taken.

The indicator is small, light and convenient to handle. The working mechanism is encased, and protected from dirt and injury. The case is heavily nickel-plated, with a dull finish. The point is of hardened steel and is easily removed when worn.



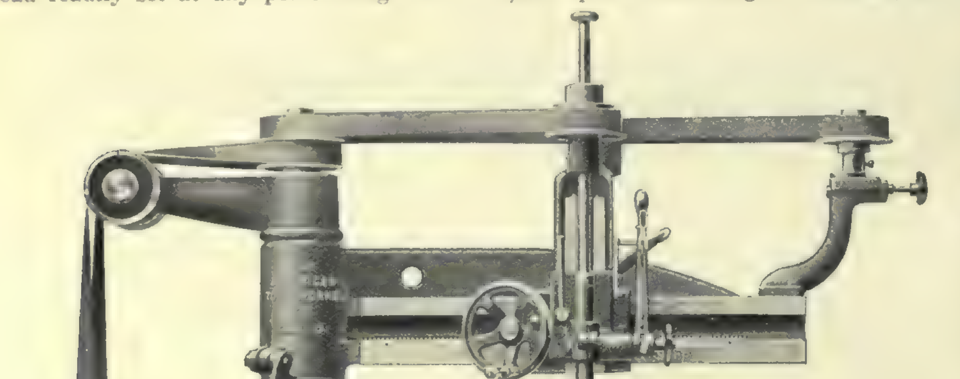
Brown & Sharpe Speed Indicator.

Each indicator is provided with a polished wooden handle. It is made by Brown & Sharpe, Providence, R. I.

HIGH SPEED SENSITIVE DRILL

The accompanying illustration shows a further development of the drill described in April and October issues of Canadian Machinery. The one shown in this (November) issue shows the 3-ft size mounted on a "pedestal base," which is not equipped with a box table. This type of machine, is particularly convenient in the drilling of a multiplicity of holes in work, which can be conveniently moved on a truck or otherwise beneath the spindle of the machine. This does away with considerable handling of the work and permits of it being moved from the drilling department along to the next department with the least possible delay.

This machine is adapted to the work in automobile and gas engine manufacturing plants, and it is due to their request that this particular type of machine was designed. The arm is easily swung to the position desired, and the head readily set at any point along the arm to locate the hole desired. Where drilling with a jig is practiced, the work is accomplished very rapidly. A spindle speed of 900 r.p.m. is available, although this may be increased or diminished to suit special requirements. As all the bearings are of the "ball bearing" type, the drill will stand up to a speed of 2,000 r.p.m. without sign of distress, but of course no twist drill will hold an edge at such a speed.

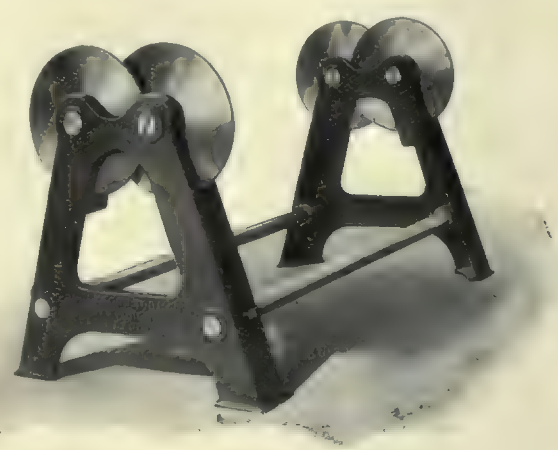


High Speed Sensitive Drill.

This drill is manufactured by the American Tool Works Co., Cincinnati.

A NEW BALANCING TOOL.

The Rockford Tool Co., Rockford, Ill., have recently put on the market a new tool for use in balancing pulleys, cones, armatures, etc. As will be seen from the accompanying illustration the tool is simply and substantially constructed. The rotating discs are hardened and ground and run in ball bearings, which makes the tool very sensitive.



The Twentieth Century Balancing Tool.

It is made in two sizes. Size 1 is intended to set on the bench and will balance a pulley up to 22 inches in diameter. Size 2 is for use on the floor and will balance any work up to 46 inches in diameter. Williams & Wilson, Montreal are Eastern Canadian agents for this tool.

A GRAVITY VISE FOR DRILL PRESS WORK.

This vise works on a principle which is as old or older than the history of machinery. It is the application of this principle to a work holder which is the new feature claimed.

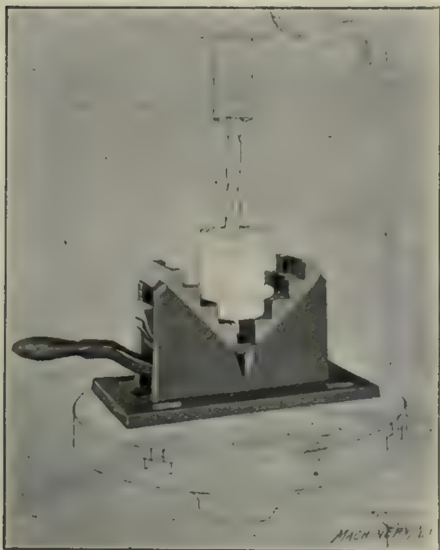
As seen in the accompanying illustration the base of the vise is essentially two planes inclined at 45 degrees to the horizontal, making 90 degrees between them. On these planes slide the two jaws which are raised by means of the handle, but which take their holding position and maintain their grip on the work by virtue of gravity augmented by the pressure of the drill. In this respect the vise is automatic.

When the pressure on the drill is decreased at the end of a hole the vise is held against turning by a slight pressure on the handle. Slots are provided for bolts, but except in extreme cases they are not necessary. In many cases it is claimed that this vise will replace a jig since special shapes are held as firmly as those of regular dimensions.

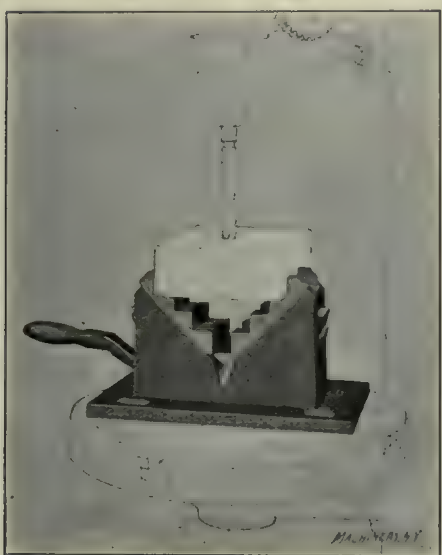
There are no springs about the mechanical details of the vise and but

five different parts make up the whole. It is very compact, measuring 7½x14 inches, and has a capacity of from ½ inch or less to 8 inches, rounds being held securely by means of the depression in the centre of each size of jaw.

The vise is made by the Mitchell-Parks Manufacturing Co., St. Louis, Mo., and is handled in Canada exclu-



Gravity Vice Gripping Round Work.



Gravity Vice Gripping Square Work.

sively by Alexander Gibb, 13 St. John St., Montreal.

NEW HYDRO-CARBON BURNER

Wherever Pintsch Gas is manufactured for railroads, there is a great quantity of refuse which is commercially called Hydro-Carbon. The accompanying r.productions illustrate a burner in actual operation with Hydro-Carbon. Fig. 1 a locomotive boiler heating corners, Fig. 2 heating a locomotive frame for straightening. This burner obtains a very clear flame.

The construction of this machine is very simple and absolutely reliable, and can be handled safely by any workman. An important feature of this burner is, that it can be changed with a slight alteration so that any liquid fuel can be successfully used with same.

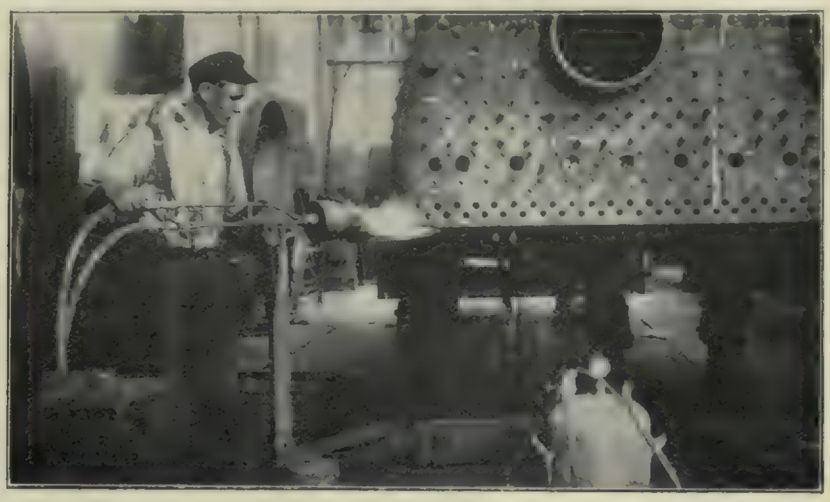


Fig. 1.—Hauck Patent Burner Used for Boiler Work.

This machine is adapted for constructing and repairing steel cars, straightening and welding engine frames. It can be successfully used for pre-heating in connection with thermit welding, constructing and repairing boilers, brazing and various other heating operations.

The manufacturers are the Hauck Manufacturing Co., of 140 Cedar St., New York City.

HARDENING STEEL.

The following is a description of a comparative test made under normal conditions in the shops of the Chicago & Alton R.R., Bloomington, Ill. Two pieces of steel were cut from the same bar 9 x 1 1¾ srock. They were forged to shape and ground by the same blacksmith, who also hardened one of these tools knowing that it was to be intended for a test. The other tool was hardened by the demonstrator in a bath prepared with "Kalux." This one was heated to the same heat as the other, but only the cutting point being hardened and that left entirely hard without drawing to color, the remainder of the tool being simply cooled off to permit of handling, there not being sufficient heat left to harden it. A drill arbor which it was desired to reduce in diameter was then placed in a lathe and the squaring off and starting cut made with another tool, thus permitting of the two test tools being used under absolutely uniform conditions as to speed, feed and class of work done. At the conclusion of the tests it was shown that the tool hardened in the hardening bath prepared with "Kalux" had done 200 p.c. more work than the other hardened by the ordinary method, and after being ground three times it still showed the same proportionate gain in efficiency, thus clearly showing that "Kalux" does not simply case harden.

Fig. 2.—Hauck Patent Burner Heating Locomotive Frames.

It is expected that tests with high speed steels will be carried on at Toronto University at an early date, to test the qualities of "Kalux" hardening solution.

CANADIAN MACHINERY AND MANUFACTURING NEWS

A monthly newspaper devoted to machinery and manufacturing interests mechanical and electrical trades, the foundry, technical progress, construction and improvement, and to all users of power developed from steam, gas, electricity, compressed air and water in Canada.

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Vol. V. **November, 1909** **No. 11**

TECHNICAL EDUCATION.

In this issue we publish a description of the apprenticeship system in use in the Angus shops, Montreal. Perhaps the most complete systems in use in Canada are those of the C.P.R. and G.T.R., the educational systems including all the railroad shops of these two companies. While some manufacturers have been slow to recognize the value of time spent in educating their apprentices and [illegible] the wheels of the Provincial Governments have been slow to revolve in [illegible] the carrying out of efficient industrial educational systems, these two great railroads have developed and applied their educational scheme all over their systems, wherever their shops are erected. Not only has the apprentice been taught along mechanical lines but railroad Y. M. C. A.'s have been built where young men might attend to their physical needs and feel the elevating influence of that branch of a man's education taken up by the Y.M.C.A.

It would be well for some of our Provincial Governments to take a lesson from the railroads. Nova Scotia is carrying out a policy and Quebec has a scheme under way, but there has been no united definite educational system evolved which will place our industrial life on a level with that of Germany and some other countries, where the artisan is carefully trained for his life's work.

Several systems for industrial education have been reviewed in Canadian Machinery. We have recognized the rapid development of manufacturing interests in our country and the problem of securing an adequate supply of skilled labor. The United States has had a remarkable record of industrial enterprise on account of its advantages as to the cost of raw material, but Germany has to a large extent offset those advantages by training the workmen.

In Canada we have the resources and we can have well trained mechanics if the governments will only take hold of the problem as they should. Then, with both these advantages, Canada will become an industrially greater nation than those countries to which we have referred. We need more intelligent artisans, and industrial education is the key to the situation.

IMPORTANCE OF SIGNS.

"Keep your name before the public" is a motto which should be hung up in the mind of every business man.

A trip through the country impresses one with the absence of signs used by manufacturers—a condition of affairs which can and should be rectified without delay.

A large number of manufacturing plants are observed with not a sign to show the name of the company or the products turned out. Signs can be procured at little expense, and every manufacturer should have one showing the name of the company in the most conspicuous place possible. They are clearly a good advertisement, and their importance must not be overlooked.

SECRET COMMISSIONS ACT.

There seems to be doubts in the minds of some as to the application of the Secret Commissions Act. It was thought that this act referred only to the civil service. While it is a copy of the English act and was introduced on account of the secret rebates exposed in the investigation of the marine department of the civil service in one of the provinces, for the purpose of preventing such occurrences in future, we understand it was first passed in England to prevent buyers going to London and getting a secret commission from the houses they bought from while in the employ of the houses for whom they bought.

Manufacturers will be interested in knowing that the Secret Commissions Act refers to ordinary business transactions as well as to the civil service.

The following letter from the Clerk of the Parliaments, Ottawa, gives a brief history of the bill:

"It was introduced into the Commons on 1st February 1909. Passed by House of Commons, 23rd February received by the Senate on 2nd March; amended by

Senate on 24th March; returned to Senate with amendments agreed to 21st April; assented to 19th May."

The amendment referred to is the principal feature of the bill which makes it general in its application. It reads:

> Every person who is a party or knowingly privy to any offence under this act shall be guilty of such offence and shall be liable upon conviction to punishment hereinbefore provided for by this section.

This, according to the best of authorities makes the traveler or wholesale house guilty of a breach of the act.

TRAVEL ON YOUR OWN POWER.

The force that is going to carry you to your goal is coiled up inside you—in your energy, your pluck, your grit, your determination, your originality, your character, says Dr. Marden, in an article to young men on "The Precedent Breaker." Further, he says:

"The sooner you become disillusioned as to getting any great assistance outside of yourself, and fall back upon your own inherent force, the better.

"It is a pitiable thing to go through the world borrowing other people's ideas, plans, methods; other people's judgment—running to this one and that for advice—never developing your own power, independence, self-reliance.

"Originality is force, life; imitation is weakness, death. There is nothing else which will kill the creative faculty and paralyze growth more quickly than imitating others, following precedent in everything, and doing everything in the same old way."

UPWARD MARCH OF CANADA'S TRADE.

The total trade of Canada for the first half of the current fiscal year has been $304,390,088, an increase of $43,221,436, or about seventeen per cent., as compared with the corresponding six months of 1908. Imports, exclusive of coin and bullion, have totalled $172,373,148, an increase of $35,727,931, or over twenty per cent. The increase in customs revenue has been $5,827,658.

The total of exports of domestic products for the half year has been $120,484,255, an increase of $10,375,204. Exports of foreign produce have totalled $9,187,371, an increase of $1,683,464.

Last year during the six months from April to September inclusive Canada imported coin and bullion to the value of $5,816,437. This year for the same period the amount was only $827,284.

For September the imports totalled $30,339,930, an increase of $6,161,155 over September of last year. Exports of domestic products for the month totalled $23,548,330, an increase of $3,554,960. The total trade for the month was $56,601,753, an increase of $7,091,184, or over fourteen per cent. The trade of the Dominion now is equal to the record figures of 1907.

The financial statement of the Dominion for the first half of the present fiscal year ending Sept. 30, shows an increase of $6,526,297 in revenue as compared with the first six months of 1908-09. On the other hand, the expenditure on consolidated fund account decreased by $1,098,335, and on capital account by $802,582. For September alone the increase in revenue was $1,570,709, while the total expenditure decreased, as compared with September of last year, by $2,584,275. Judging by the figures of revenue and expenditure for the first half of the year, the surplus of receipts over ordinary expenditure at the close of the year should be the largest on record.

The main figures for the month and for the six months are as follows:—Revenue—September, $8,853,659; six months, $47,353,819. Expenditure on consolidated fund account—September, $5,210,213; six months, $31,563,393. Expenditure on capital account—September, $3,967,321; six months, $13,213,063. The net debt of the Dominion on September 30th, was $320,698,464.

Canal traffic returns since the opening of the season show an increase of eleven million tons over the same period last year. The Soo Canal alone shows an increase of ten and a half millions. The Trent Canal alone shows a decrease in traffic.

AN EXPORT BUREAU.

An export bureau is being established by the Trade and Commerce Department at Ottawa, for the purpose of encouraging and facilitating export trade. It is proposed to establish a list of Canadian manufacturers and others who desire to extend their trade to Great Britain and foreign markets. Circulars are being sent throughout Canada inviting such firms to send in their names and lists of articles they are in a position to sell abroad. With this information the Department of Trade and Commerce will be in a position to supply it to its agents, of which it has six in Great Britain, one in France, two in South Africa, one in Mexico, one in the West Indies, two in Australia, one in China, one in Japan, one in Holland, and one in Newfoundland.

Nothing of this kind has ever before been attempted in Canada, and it will entail great labor in the department in indexing the information to make it readily available when required. But it is to be hoped that it can be made the basis of a permanent list which will be immediately available at all times in the advancement of the foreign trade and commerce of Canada. The department desires the name of every exporter from the Atlantic to the Pacific, with a detailed list of the goods they are in a position to sell abroad.

BOILERS REQUIRE CARE.

"We find that John Pickering came to his death by being scalded by water escaping from a boiler not properly blown off, and the D. B. Martin Co. be censured. It is our opinion that the engineer should have seen that the water was all out of the boiler."

The foregoing verdict was brought in at the Morgue, Toronto, Sept. 29, 1090, by a jury under Coroner Hopkins, touching the death of John Pickering, an employe of the D. B. Martin Abattoir, who died in the Western hospital from injuries received by the blowing out of a hot water pipe. Boilers are not play toys. They require careful handling. You cannot play with a match in a powder magazine. The result will be disastrous.

Canadian Machinery has, on many occasions, drawn the attention of its readers to the danger of unprotected machinery and belting. A fatal accident is reported from Berlin where a young man in the prime of life was drawn into the shafting by a belt making two hundred revolutions per minute. Proprietors, superintendents, foremen and workmen should unite in protecting all dangerous belting and machinery.

FOUNDRY PRACTICE AND EQUIPMENT

Practical Articles for Canadian Foundrymen and Pattern Makers, and News of Foundrymen's and Allied Associations. Contributions Invited.

NEW ADDRESS OF A.B.F.A. SECRETARY.

W. M. Corse, secretary and treasurer of the American Brass Founders' Association, has accepted the position of works manager of the Lumen Bearing Co., Buffalo, manufacturer of Lumen bronze, manganese bronze, aluminum castings, etc. In future all communications from members of the American Brass Founders' Association should be addressed to Mr. Corse in care of the Lumen Bearing Co.

PRODUCTION OF PATTERNS FOR LIGHT CASTINGS.*

By W. H. Sherburn.

The general term "light castings" covers a very wide range, and, therefore, we shall confine our consideration of this

Fig. 1.—Section of Cast Iron Frieze, Showing Inequalities of Metal Thickness.

subject to one metal and to one branch, which I will term the domestic branch. This deals largely with the fireplace and its furnishings. The range of patterns is wide and varies from the simplest flat plate, which a shop boy can make, to the most elaborately modeled design. Just as the artistic finish of the pattern has so wide a range, so do the materials and methods by which they are produced. Wood, for all the plainer patterns, is generally the material used, but for the patterns to which I refer, wood takes a secondary position, except as a backing and boarding for the patterns made in other materials.

* From a paper presented at the Birmingham Convention of the British Foundrymen's Association.

In producing this work we must have not only co-operation, but sympathy between the designer, patternmaker and molder. The molder should have a wide

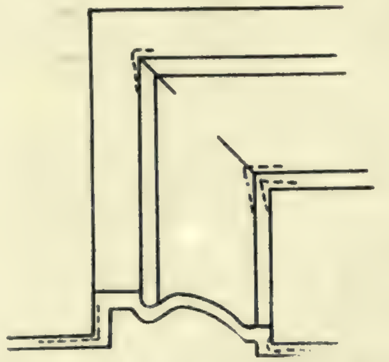


Fig. 2.—Corner of Cast Iron Panel Molding Showing the Effect of Repeated Casting, Three Shrinkages—Original Pattern, Pattern Plate and Casting.

knowledge of molding methods and should know something about patternmaking. The patternmaker should have a knowledge of molding methods and the action of metals in cooling. He should also know something about design and ornamentation. I am giving the patternmaker rather a high mark to aim at, but he should attempt it. The designer must keep in view the essential purpose of the pattern he is designing. He should know the best form in which it can be made without destroying its usefulness in any way. He must know all about designing, a great deal about patternmaking, and should have some knowledge about molding.

Fig. 3.—Corner of Panel Properly Designed.

Unfortunately, this is not frequently obtained in the light castings trade. Very often the designs have been purchased from an artist who has known practically nothing of the technicality of cast iron. The designer naturally objects to the patternmaker taking liberties with his work, but, unfortunately, they must frequently be changed before they can be reproduced.

Occasionally, a frieze, shown in Fig. 1, will be received from the designer. This is an extremely difficult section to cast straight and the designer, without a knowledge of practical work, will occasionally provide for right-angle edges and deep sections. Unless modified by the patternmaker trouble will follow in the foundry. The outer edge will cool rapidly, while the heavy section will retain its heat and strains will result.

In constructing a panel, the designer will occasionally furnish a section similar to the one shown in Fig. 2. Such a pattern will have to be cast three times

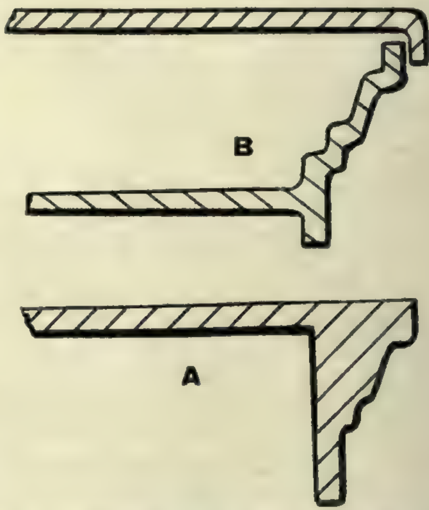


Fig. 4.—Cast Iron Model Shelves—Good and Bad Design.

to secure the master pattern, a working pattern or plate, and ultimately the casting. Plate molding exaggerates all the difficulties in regard to bends, twists, and shrinkage. A square mitre or a right-angle in casting iron, is a point of weakness. The design begins to loose its form at the mitres in the direction shown in Fig. 2, and when ultimately the casting is obtained from the plate, the mitres sink and lose their shape. The designer should have filled the inner angles of his panel without necessarily loosing any of the artistic effects. This suggested change in position is shown in Fig. 3.

A mantel shelf edge is shown in Fig. 4, and to make this casting in one piece it would be necessary to have a heavy

edge on a light plate, as shown at A, and what would transpire if it were made in this way would not be difficult to imagine. A more satisfactory method of constructing this pattern would necessitate the production of two castings, instead of one, the top plate forming part of the edge, and the bottom plate the other half.

If the pattern is highly ornamented, the designer makes his model in clay, and from this he casts a mold in plaster and usually overlays the plaster mold with a thickness of clay equal to the thickness of the finished casting. The back mold is then cast in plaster and when set the molds are separated, the clay removed and the intervening space is filled with wax. From this wax model a casting can be made in soft metal, which is then cleaned and chased, which is used as a master pattern.

Methods differ greatly in different districts. There used to be a Scotch method and an English method of patternmaking, each of them, of course, being the best. The English method is what we may call "the more artistic" method. The Scotch we may call the "scientific" method. Scottish patternmakers always paid great attention to their lines and the uniformity of their thicknesses. The English patternmakers look more to the artistic and were very proud of their work from an artistic standpoint. Both of these methods are correct to an extent, and during the last fifteen years there has been a blending of these two, to the advantage of both.

ECONOMICAL METHOD OF HEATING STEEL USING STOKERS.

By W. Almond Hare, B.A., Sc.

The selection of the most economical means for heating steel in a manufacturer's plant, presents a problem that to the uninitiated is one of considerable obscurity. Unfortunately the art has been shrouded in a certain amount of mystery and with the various claims put forth by manufacturers of different systems it is not easy for those without a practical experience in this work to select the most economical system.

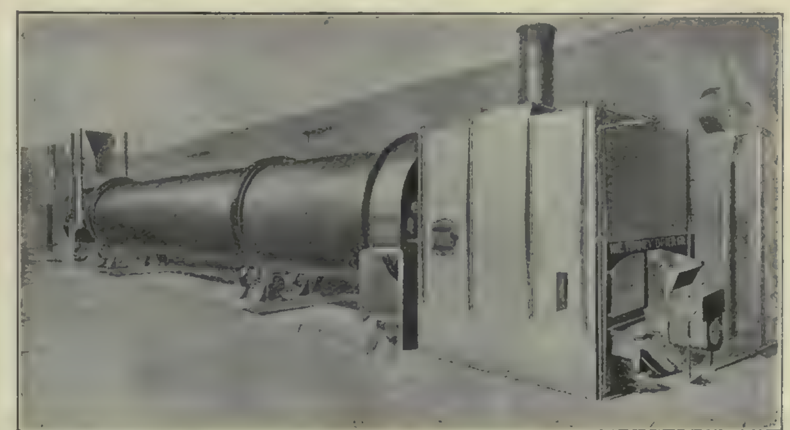
When the problem of this kind presents itself, the main feature which the purchaser must keep steadily before him is the cost of operation. In material of this kind the depreciation of the metal parts is not excessive and that of the brickwork does not differ materially whatever system is selected, so that the first cost within reason does not exert a very great influence on the problem.

The selection of the system is really a selection of the kind of fuel. In this we have the following principal fuels to choose from :

Large Work— Continuous or intermittent. (Billets, skelp, slabs, large plates).	Natural gas Producer gas, regenerative type Lump Coal, reverbatory type. (hand fired.) Slack Coal, reverbatory type (stoker fired.)	
Medium Work— Locomotive and other forgings, bolts, nuts, rivets, plates, spikes, axles, rods, small billets, springs, etc., etc.	Natural gas Producer gas Anthracite coal Lump coal, hand fired Slack coal, stoker fired Crude or fuel oil.	 Reverbatory. " " "
Small Work— Rivet heating for steel workers, tool making, small forging or welding, etc.	Natural gas Producer gas Anthracite coal Crude or fuel oil Slack coal, stoker fired.	

Natural Gas.

The factor of location governs the selection of this fuel, as the cost of piping the gas to any great distance precludes its adoption. It is perhaps the cleanest and handiest of all fuel, but after all the main fact of the matter, from the manufacturer's standpoint, is that of operating cost, and therefore one is not justified in using natural gas unless by doing so the cost of heating



Rotary Dryer, Using Stokers and Burning Soft Slack Coal.

the steel can be reduced below that of some other method. In some industries, it is important that no dust or dirt be allowed in the air, owing to possible injury to delicate machinery, and in these instances, which are, however, rare, it is best to burn such fuels as gas or oil as depreciation is of great account, Where, however, there are no such restrictions as these, as would be the case in almost all of the manufacturing industries, natural gas will be found expensive unless it can be obtained at a very low figure.

In ordinary types of furnaces for medium work the allowable rate to pay for natural gas per 1,000 cu. feet can be found by the formula :

$$r = .035\ c.$$

Where r equals rate per 1,000 ft. for gas and c equals cost per ton of a good gas slack coal delivered in the works. Where good slack coal can be obtained of a quality known as "Pittsburg gas slack," with a calorific value of 13,800 B.t.u. per pound for a price in the neighborhood of $3 per ton, natural gas at 10 cents per 1,000 cu. ft. offers no inducement in preference, provided, of course, that furnaces adaptable in each case are installed, and where the work is moderately large. Gas furnaces for very small work can be made more economical than coal furnaces, and this is true even if the price of gas exceeds the figure calculated by the above formula by reason of the fact that the flame can be a little better localized and less heat is dissipated in radiation, etc. In larger furnaces, heating say more than 1,000 lbs. of steel per day, coal furnaces burning soft slack coal and fired automatically by mechanical stokers will show a higher economy in operation.

A recent test conducted by a large rolling mill in Pennsylvania showed a

very considerable saving for the stoker fired furnace over natural gas at 10 cents per 1,000 cubic feet.

This furnace was designed and built for gas and was altered partially for the application of the stokers. If the furnace had been designed originally to accommodate the stokers the coal consumption would no doubt have been considerably below 635 lbs. per ton, as the economy depends to a great extent on the design of the furnace. Even with the very poor quality of coal burned, the price per ton of the coal could have been as high as $2.50 before the cost of heating one ton of steel would have been as high as with gas at 10 cents per thousand feet.

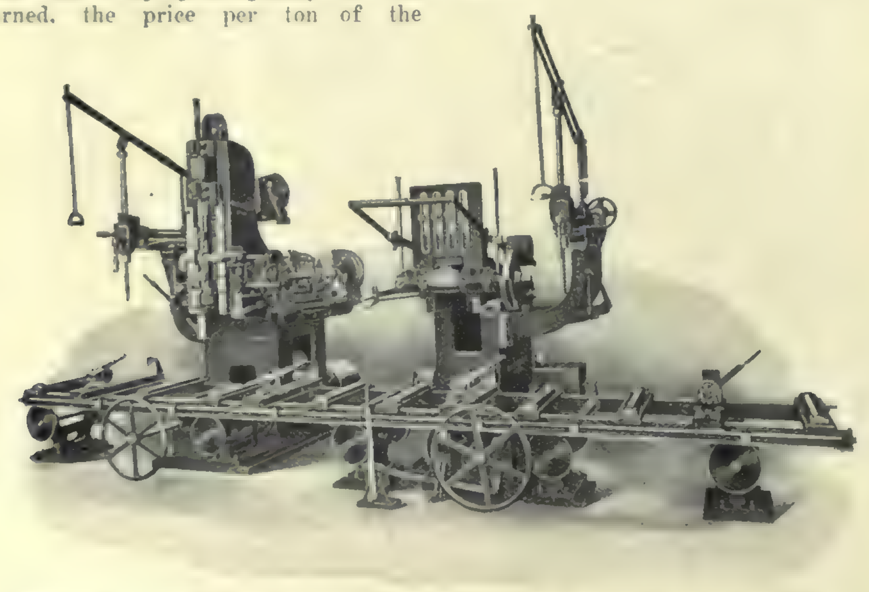
Test of Slack Coal Using Stokers and Natural Gas.

Date of test—Week ending Feb. 1, 1908.	Coal.	Gas.
Total steel heated	200.8 tons.	
Total coal burned	127,640 lbs.	
Total gas burned		16,064,000 cu. ft.
Coal burned per ton of steel	635.65 lbs.	
Gas burned per ton of steel		8,000 cu. ft.
Cost of coal per ton	$1.35	
Cost of gas per M. cu. ft.		$0.10
Cost of coal per ton of steel	$0.43	
Cost of gas per ton of steel		$0.80
Saving of coal over gas	37 per cent.	
Weekly cost using gas		$160.64
Weekly cost using coal	$86.17	
Weekly saving in favor of coal	$74.47	
Additional weekly charges, interest depreciation, etc.	$3.87	
Net weekly saving	$70.60	
Net yearly saving (50 weeks)	$3,570.00	

In the December issue further figures will be given and the whole subject of heating steel will be entered into. As this is of vital interest to practically every manufacturer of steel products, it should be followed with great interest.

TOOL FOR CAR AND BRIDGE CONSTRUCTION.

There has been a long felt need among car and bridge constructors for a machine that would mortise and gain heavy material without moving it from one machine to another—thereby saving a considerable amount of time and labor. The J. A. Fay & Egan Co., 362-382 W. Front St., Cincinnati, O., introduced a machine of this kind to the market.



Combination No. 214 Vert. Hollow Chisel Mortiser and No. 150 Aut. Car Gainer.

The manufacturers have constructed this machine by placing their No. 214 vertical hollow chisel mortiser and No. 150 automatic car gainer side by side with a single traveling table. This combination machine has capacity for timbers up to 20 inches thick and 24 inches wide.

The company have just issued a circular showing a large half-tone photograph of this machine together with detailed description which they are mailing to those sending a postal for it.

RECORD ENGINE REPAIR WORK.

The other day some ambitious C. P. R. machinists at Winnipeg, showed anxiety to test their abilities as skilled workmen against the workmen on United States railways. It took the shape of the rapidity in which was what is known as "Number One Repairs" could be completed. The record for the American repair shops was seven days on a first-class engine. Satisfied that they could leave their cousins in the shade, they proceeded on a recent Monday, at 6 a.m., on one of the big freight engines. From the very start there was no doubt as to the result, and in two and a half days the full repairs were completed and the engine sent off to Brandon. This record smashes any record extant by four days and a half, putting the American record, not only in the shade, but in vertiable darkness. Two gangs were kept at work, one during the day and the other at night. The men were particularly jubilant.

MARK TWAIN ON THE VALUE OF ADVERTISING.

"It pays to advertise," said Mark Twain at an advertisement writers' banquet. "When I was editing the "Virginia City Enterprise," writing copy one day and mining the next, I tried to force this truth in many ways.

"A superstitious subscriber once wrote and said he had found a spider on his paper. Was this good or bad luck ? I wrote to him in our 'Answers to Correspondents' column as follows :

" 'Old Subscriber—The finding of a spider in your copy was neither good luck nor bad. The spider was merely looking over our pages to find out what merchant was not advertising, so that it could spin its web across his door and lead a free and undisturbed existence forever after.' "

A. B. Walker, formerly of Canadian Fairbanks, Toronto, has accepted a position in the machine tool department of H. W. Petrie, Toronto.

H. A. Harrison, formerly of the Milroy-Harrison Co., has taken a position as machinery salesman with the Canadian Fairbanks Co., Toronto.

The man who thinks that his goods will sell themselves, like the girl who expects a sweetheart to look her up, usually has a lot to say about unjust competition.

INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News.

Foundry and Machine Shop.

The M.C.R. anticipate a busy winter in their St. Thomas shops.

Work has been started on the new I.C.R. repair shops at St. John.

The Cockshutt Plow Co., Brantford, are making additions to their plant.

The Northern Engineering Co., Fort William, will build a second additional warehouse.

The General Shoe and Machinery Co., Quebec, propose erecting a branch factory at Hull.

The B. C. Electric Co. will erect a second car shop at New Westminster for the repair of cars.

The Dominion Wrought Iron Wheel Works, Orillia, is erecting a new building for warehouse purposes.

The Burton Saw Works have secured a site of ten acres at Burnaby, and will move their plant there from Vancouver.

The Moose Jaw Stove Co. is a new concern, which will make a straw-burning stove. A plant will be built at Moose Jaw.

The Atikokan Iron Co., Port Arthur, will operate their plant all winter, having made arrangements to sell their output in the east.

The furnaces at the Granby smelter are being further enlarged to smelt about 4,500 tons of ore per day and manufacture 40,000,000 pounds of copper per annum.

Spencer & Halsey, makers of gasoline engines Montreal, have dissolved partnership; and a new company has been formed under the title Harry W. Spencer & Co.

The Irondale Steel Co., of Irondale, Wash., intend to locate a plant, similar to the one at Irondale, somewhere in the Province of British Columbia, on a site to be selected.

The Vancouver Engineering Works has installed a new complete plant for the production of steel castings, having adopted the surface blown bessemer process for making the steel.

The Corrugated Pipe Co., an American concern, manufacturing corrugated steel pipes for culverts and drainage purposes, is seeking a site in Ontario, and may locate at Lindsay.

D. D. Mann is authority for the statement that the Canadian Northern Railway will erect its general repair and construction shops in Toronto, and that they will employ between 2,500 and 4,000.

A new building going up at Bridgeburg will house the Ferro Steel Co., of Cleveland, Ohio, and the Tuttle & Bailey Mfg. Co., of New York. The latter company will manufacture steel registers.

Negotiations are in progress whereby it is expected that the Canadian Gas Power & Launches of Toronto and Chatham, will dispose of their Chatham plant, formerly the Defiance Iron Works, to a new firm.

The Canadian Graving Dock and Shipbuilding Co. intend to erect a shipbuilding plant in Canada and are asking information about Sydney, C.B., and what inducements would be offered the company to locate there.

John McKechnie has purchased the machine shop of W. A. Spence, rear of 16 Millstone Lane, Toronto, where he will make special machinery, dies, models, tools, etc., in addition to doing general repair work.

The new tube works of the Page-Hersey Iron and Tube Co., Welland, are now in the process of erection. An inch mill in addition to the buildings now in course of construction, will also be built. About 500 hands will be employed.

Frederick E. Seedering, of New York, who represents a well-known eastern American gasoline engine manufactory and yacht building concern, is interested in a new boat-building and marine engine industry which proposes to locate at Vancouver.

Work is now being rushed on the new boiler and structural steel works which the Doty Engine Works is erecting at Goderich. It is intended that the boiler works will be completed by December, and that when equipped fifty hands will be employed.

A machine and locomotive works to cost $300,000 will be running in Vancouver within six months, according to the plans of the Sumner Iron Works Co., of Everett, Wash., whose officials have closed a deal whereby they have acquired 30 acres of land in Burnaby.

The Vancouver Docks, Ltd., at a recent meeting of the Point Grey council guaranteed the expenditure of $1,500,000 in seven years upon the receiving of the charter to build a breakwater and dock in English Bay. The breakwater will be about two miles long.

The Automatic Tool Co., Toronto, has made an assignment for the benefit of the creditors. The assets of the concern are about $1,600, and the liabilities about $600. The company had been in business only a few months and prospects seemed bright, when the financial pinch came.

A great structural steel works and shipbuilding yard and drydocks in which will be built 600-foot steel leviathans for the traffic of the great lakes are two industrial plants proposed to be built in Toronto within the next year of two, by the men who now constitute the Polson Iron Works.

H. S. Holt, president of the Montreal Light, Heat and Power Co., and F. W. Thompson, of Montreal, vice-president and general manager of the Ogilvie Flour Mills Co., are interested in a wire and iron rolling mill proposed to be built at Fort William and on which $500,000 is expected to bt spent.

The C.P.R. has closed its shops at Farnham, Que. About 400 men were employed there and $20,000 at least is paid in monthly wages. It is understood that the employes will all be taken on in the Angus shops, Montreal. At C.P.R. headquarters it was explained that the change was in the interest of economy and efficiency.

The Vulcan Boiler Works, until lately located at New Westminstr, will be moved to a new site on the North Arm of the Fraser river and the plant and buildings will be greatly enlarged to meet the increased business. The present site of the Vulcan Boiler Works has been purchased by the B. C. Electric Railway Co. with the intention of erecting new freight sheds thereon.

The Vancouver Engineering Works has installed a plant that will enable the company to give better satisfaction to those who use mining, sawmilling and manufacturing machinery, and who desire something stronger than cast iron for certain uses. Special attention will be given to logging machinery, and a fully equipped chemical laboratory will be maintained.

It is estimated that the proposed dry-dock for Owen Sound will cost $225,000 and that the town council, will vote substantial financial aid to the scheme. Plans will be sent to Ottawa with a view of having the undertaking subsidized by the Dominion Government. The Polsons of Toronto, who formerly operated the steel ship-building plant there, have offered to enter into a working arrangement with the new concern.

McDougall & Jenkins, engineers, are making progress with the work of establishing their works on their new property at North Vancouver. The machine and boiler shop will be the first to be erected. The machinery will consist of the entire plant which which has been in use by McDougall & Jenkins, at Victoria, together with $10,000 worth of new machinery, recently ordered from Chicago. It is expected that the works will be in operation in three months.

The Valleyfield Iron Works, Valleyfield, P. Q., have added a new department to their manufacturing. They have only recently commenced the making of aluminum castings under the supervision of Mr. A. Moore, who has had many years' experience in his branch of foundry work. The company has installed the very latest equipment for this sort of work and are prepared to give very prompt delivery on aluminum castings. The head office is at 324 W. Craig St., Montreal, in charge of Mr. Siegfried Schopftocher.

Without a dissenting vote, the rate payers of Chippewa recently passed a by-law granting exemption for ten years and a fixed assessment of $25,000 for a further ten years to the Electrical Furnace Products Co., of Pittsburg. The company has purchased nineteen acres of land and have already begun the erection of a $50,000 steel plant to manufacture structural steel. The plant will be in operation before spring. The company will employ about sixty men to commence with.

Municipal Undertakings.

A $17,000 waterworks system is suggested for Carlyle, Sask.

Excavation work has been commenced on Cobalt's waterworks system.

Armstrong, B. C., ratepayers favor spending $10,000 on improving the water and light services.

Portage la Prairie ratepayers will shortly vote on a by-law to raise $17,500 for waterworks.

Fort William has accepted Engineer Galt's plans for the new waterworks intake pipe to cost $30,000.

New Westminster's waterworks intake pipe will be enlarged to supply Coquitlam and Port Moody with water.

A by-law has been passed at Brockville to issue $4,050 debentures for the purchase of road-making machinery.

The contract for excavation for water mains in St. John, N.B., was awarded to Robert Short and Peter Arsenault.

Summerland, B.C., council proposes to buy the domestic and irrigation water systems of the Summerland Development Co.

The by-law authorizing the installation of a $25,000 municipal water system has been passed by the Trail, B.C. ratepayers.

Wells & Emmerson received the contract for 3,500 feet of 20-inch spiral rivetted pipe for Port Arthur's waterworks intake pipe.

The proposed water systems, to embrace the municipalities of Burnaby, South Vancouver and Point Grey, are estimated to cost $500,000.

The Perth, Ont., town council has awarded the contract for sewer work to Mr. Haggarty, of Brockville, Ont., for the sum of $3,400.

The municipality of St. Pierre, Montreal, has

awarded the contract for the laying of sewers for the amount of $61,000 to J. Henault.

At a recent meeting of the St. Catharines city council the necessity of another waterworks main from the reservoir to the city was discussed.

The Ottawa city council almost unanimously passed a by-law sanctioning the purchase of a site for a civic incinerator plant at a cost of $10,000.

A by-law to provide $4,000 for the purchase of an additional pump at the pumping station has received the sanction of the ratepayers of Red Deer, Alta.

A new rand compressor, capable of pumping over one million gallons of water, will be purchased by the London water commissioners for the Horton Street wells, at a cost of $1,400.

City Engineer Ker recommends to the Ottawa Water Committee the establishment of a reservoir with a capacity of 30,000,000 gallons. The cost of the work is estimated at $150,000.

It is expected that tenders for the proposed new septic tank and filter for the Cobalt disposal plant will be called for shortly, though work on these will not start till next spring.

At a recent meeting of the Montreal Road Committee, tenders were opened for the construction of a sewer on Eighth Avenue, Rosemount. The contract was awarded to Mr. Ferris at $9,982.

The Toronto Board of Control recently awarded contracts as follows: Sewers—Emerson Avenue, McKnight Co., $1,940; Davenport Road, Godson Co., $41,380; Humberside Avenue, Maguire Co., $41; Keele St., Excelsior Co., $300.

At a recent meeting of Coldwater ratepayers it was resolved that the council be asked to have a by-law submitted to the people to decide whether the village will instal a system of fire protection alone, at an approximate cost of $10,000, or a complete waterworks system at an approximate cost of $29,000.

Over ten miles of steel pipe, costing over a million dollars has been ordered by the Esquimalt Waterworks Co. from the Vulcan Works, Motherwell, Scotland, to bring the Goldstream water to the City of Victoria. Delivery is to begin on March 1, and 55,000 feet of steel pipe is to be landed before June 30 next.

Tenders will be received by registered post only addressed to the chairman of the Board of Control, city hall, Toronto, up to noon on Tuesday, November 16th, 1909, for the supply of three thousand feet of rivetted steel pipe 60 inches in diameter, and five hundred feet of rivetted tapered steel pipe, also one thousand seven hundred and eighty-two lineal feet of 60-inch reinforced concrete pipe for the outfall sewer.

Railway Development.

The Canadian Northern's new road from Toronto to Ottawa will cost in the neighborhood of $10,000,000.

A party of G.T.P. engineers is in the district about Duck Lake locating a line from Watrous to Prince Albert.

The construction of the National Transcontinental railway north of Lake Nepigon is being rushed to a finish.

Twenty miles of the Great Waterways Railway will be built this year between Edmonton and Fort McMurray.

B. Corey has applied for a franchise to operate an electric railway on the streets of Welland. It is expected to run from Port Colborne to Niagara Falls.

A company is being organized to build and operate a street railway in Lethbridge and connect it with Royal View and other towns in the near vicinity.

The steel of the B.C. electric rgilway company has been laid from New Westminster to Cloverdale, a distance of 12 miles, comprising the first section of the Chilliwack extension of this company's line.

The N., St. C. & T. Railway will at once start extending the line from Welland to Port Colborne, and it is expected to be in running operation this fall. The survey has been completed and a lot of the material ordered.

The ratepayers of Guelph will at the January municipal elections vote on an extension of the Guelph Radial Railway system, not only to Puslinch Lake, but also to Hespeler, to connect with the extensive system running into that town.

The contract for the construction of the uncompleted portion of the Alberni branch of the Esquimalt & Nanaimo railway, a section about 27 miles, at the western end of the road, has been awarded to the Calgary contractors, Janse, McDonell & Timothy.

Surveys are being made for a Great Northern line to run from Brandon to Regina, connecting the Great Northern line known as the Brandon, Saskatchewan and Hudson Bay, and the line chartered to run from Minot, N.D., to Regina. Construction will be started before the end of the year.

The contract for extending the railway right of way along the front of the town site at Prince Rupert, has been awarded to Foley, Welch & Stewart. The contract calls for the expenditure of over $500,000. Sub-contracts have been awarded to Angus Stewart and V. W. Smith & Co.

Laying steel on the line of the Canadian Pacific between Saskatoon and Wetaskiwin has been completed. This line will constitute the main line of the Canadian Pacific between Winnipeg and Edmonton, and much traffic which now goes by way of Calgary will be diverted to it as soon as possible.

A syndicate of Oshawa manufacturers will build an electric road from Cobourg to Toronto. Application will be made to the Dominion parliament at the approaching session for a charter for the "Toronto and Eastern," as it will be known. Mr. Fowke, M.P., will take charge of the bill.

S. Anderson, who is now operating 40 miles of electric railway, is looking into the possibility of a street railway extension from Fenelon Falls to Bobcaygeon passing through Sturgeon Point, and it has been suggested that a large hotel and pavilion may be erected on the beach at the east end during the coming winter.

The tri-weekly passenger trains over the Grand Trunk Pacific Railway, which have hitherto run only to Scott, Sask., will go through to Wainwright, Alta., 100 miles farther west. The regular passenger service is now within 115 miles of Edmonton, and it is stated that through trains from Winnipeg to the Alberta capital will be in operation this month.

William R. Clarke, financial manager of the Alberta & Great Waterways Railway, which holds a charter to build from Edmonton to Fort McMurray, and holds also a Provincial Government guarantee of bonds for the line, announces that he is prepared to commence immediate construction upon the road. The capitalization of the company includes English, French and American money.

Structural Steel.

The Consumers Gas Co., Toronto, will erect a new gasometer to cost $250,000.

E. Millet has the contract for building a new bridge over Baynes river, at Comox, B.C.

Pease Bros. were awarded the contract to build a bridge over the First river, at Port Arthur.

The contract for the Castor river bridge, near Ottawa, has been given to Helmer Bros., Newington.

The tender of the Jenks Dresser Co. for the steel work of the new Parkdale school, Toronto, $2,800, was accepted.

The Selkirk, Man., council are proposing a joint bridge over the red river with the municipality of St. Andrews.

It is announced that the Pennsylvania Steel Co., Pa., are to tender for work in connection with the Quebec bridge.

It is now practically decided that the new bridge across the Coaticook river at Coaticook, Que., will be built next spring.

The contract for the steel work in the Consecon bridge at Picton, Ont., has been awarded to the Hamilton Bridge Works, at $984.

The Montreal Shiplining Company's tender of $1,124 was accepted for the work on the overhead bridge at St. Helen's Island ferry wharf.

The Dominion Bridge Co., Montreal, will supply the steel to be used in the construction of the new Trust & Loan building at that place.

Plans for the Queen Street high level bridge, at the Don river, Toronto, have been prepared by the city engineer for the Railway Commissioners.

The contract for the sub-structure of the C.P.R. bridge over the Richelieu river, between St. Johns and Iberville, has been awarded to Quinlan & Robertson, Montreal.

City Engineer Speakman, of Brandon, has been instructed to prepare plans and estimates for a subway or bridge at a crossing of the Great Northern and C.P.R. tracks on 18th Street.

Ald. McBridge is interested in a movement at Vancouver to secure the construction of a bridge across the intervening territory abutting on False Creek, from Keefer street or Westminster avenue.

The Dickson Bridge Co., of Campbellford, were awarded the tender for the steel superstructure of the Wilton avenue bridge, Toronto. Their price is $35,809, or 4 9-10 cents per pound, for a 438-ton superstructure.

Contracts for the reconstruction of the burned wing of the Parliament buildings were let recently. The steel for the building will be supplied by the Dominion Bridge Company, and must be delivered by November 15.

The following bridge contracts were awarded by the N. B. Public Works Department recently: Hatfield bridge, Simonds, N.B., W. R. Fawcett, Temperance Vale, $900; Dingey bridge, Simonds, Aaron Shaw, Peel, Carleton county, $600; Ellis and Maugren bridges, Brighton, N.B., W. R. Fawcett, $3,300.

Electrical Notes.

T. Collins, Montreal, has secured the contract for the new power house at Verdun, Que.

Kamloops council intends installing a modern fire alarm system.

The Cornwall Board of Trade has endorsed the Long Sault power scheme.

The B. & H. radial railway intend erecting a power house at Brantford.

The demands on the Revelstoke, B.C., power plant exceed the present capacity.

The Waterloo Board of Trade is discussing the establishment of an independent telephone system.

The Canadian Niagara Power Co. are seeking a franchise for the supply of power in Bridgeburg.

The British Columbia Telephone Co. will shortly establish a telephone system in Prince Rupert.

The Cranbrook, B.C., Electric Light Co., have made arrangements to erect a $7,000 power house.

A private company is said to be preparing to develop power at Burleigh Falls, near Peterborough.

Tenders are asked for the construction of the transmission line to supply Port Arthur with power from Dog Lake.

Montreal has been authorized by the Quebec Legislature to borrow money for the purchase of the Montreal Water & Power Co.

The Otonabee Power Co., who have asked Peterborough for a twenty-year franchise, propose to spend $250,000 in uniting their two dams.

The contract for the conduit electric wiring of

"B" Postal Station, Point St. Charles, has been awarded to the Empire Electric Co., of Ottawa.

The Georgian Bay Power Co. has offered to sell 1,500 h.p. to Owen Sound at $20 per h.p. at Eugenia Falls, or $24 per h.p. delivered at Owen Sound.

John B. McRae, consulting engineer, has been engaged by Renfrew, Ont., to report on the advisability of installing a municipal electric power plant.

It is learned that the promoters of the Sherbrooke Street Railway extension are seriously considering the proposal to purchase and develop the Westbury power.

A by-law will be submitted to the electors of Norwich, Ont., for making a contract with the Hydro-Electric Power Commission for 150 horse-power of electric energy.

A special meeting of the Board of Trade held to discuss the question of electric light and power for the town of Yorkton passed a motion favoring instalation.

The Camrose, Alta., Tannery Co., have decided to instal an electric lighting plant of their own. A dynamo with a capacity of about 150 lights will be installed.

The Dominion Iron & Steel Co. have decided to operate their pumping station at the Sydney River dam by electric power transmitted direct from the steel plant.

The National Carbon Co., Cleveland, Ohio, makers of electrical batteries, carbons and supplies, will locate a Canadian factory at Toronto to employ over 200 hands.

Plans are being made by the Niagara, St. Catharines and Toronto Railway Co., to construct a rotary transformer station at St. Catharines with an output of 500 k.w.

A contract was awarded to the Canadian General Electric Co., to supply electrical and power machinery and line material to the Nanton, Alta., electric power plant for $9,965.

Waterloo, Ont., council has purchased for $15,500 the outside plant of the Electric Power Co. there, preparatory to making a contract with the Hydro-Electric Commission.

The officials of the Saraguay Electric Light and Power Co. have renewed their offer to the Montreal Council to light St. Andrew's, St. Joseph's and St. George's wards for $70 per lamp.

A $3,000 fire at Deschenes power house occurred on Oct. 19 which for a couple of hours tied up the Hull street cars, as well as a number of factories in Hull. The plant is running again.

The action brought by R. S. Morris, Hamilton, to restrain that city from entering into a contract with the Hydro-Electric Power Commission for one thousand horse-power, was dismissed.

The Shuswap Power Co. has submitted three alternative proposals to the Kamloops city council which are largely based on the figures suggested by the city's consulting engineer, H. K. Dutcher.

The management of the British Columbia Electric Railway Co. has given the contract for the erection of five substations along its extension from New Westminster to Chilliwack to T. R. Nickson & Co.

Twenty-five cycle power has been agreed on for all purposes as the standard for Niagara hydro-electric power. Rotating machinery will be dispensed with as far as possible, and static transformers will be used.

The Nova Scotia Construction Co., of Montreal, has been awarded a sub-contract, amounting to approximately $200,000, in connection with the Canadian Light & Power Co. development work at St. Timothee, Que.

At a combined meeting of the Board of Trade and the town council a proposal to enter into negotiations with the Hydro-Electric Power Commission for a supply of power was unanimously endorsed at Paris, Ont.

H. S. Acres, engineer of the Ontario hydro-electric commission is arranging for the building of a sub-station at Port Arthur through which the commission will supply power from the Kam Company to Port Arthur.

The parish of Pointe aux Trembles, Que., have awarded to the Saraguay Electric & Water Co., an exclusive franchise for 25 square miles on the Island of Montreal, stretching from Boute de Isle to Longue Pointe.

On June 1 next Hamilton will commence to purchase electrical energy from the Hydro-Electric Power Commission. In accordance with the decision of the ratepayers the city will enter into a contract for 1,000 horse-power.

Fifty men left Victoria recently to join those employed in the preliminary work of the installation of a 10,000 horse power electric generation plant at Jordan river for the British Columbia Electric Railway Company.

Fort Frances will get power at $12 per h.p. from the hydro-electric plant at International Falls. The instalation of the street lighting system is now going on and by December the entire lighting system will be in working order.

Hamilton will have to pay $12,000 more than it figured on for the electric meters at the Beach pumping station and the $30,000 voted by the ratepayers will not cover the cost. This extra expenditure is due to the high voltage of the Dundas line.

The debris of the old Badaur power house at Perth, Ont., has been cleared away, and stonemasons are now engaged in putting up a new building. The work is being rushed. Manager Smith hopes to have the new power house ready by December 1.

The Creston, B.C., Power, Light & Telephone Co. is putting the finishing touches to its new telephone system. Altogether there are about fifteen miles of line hung. The electricians have installed the new switchboard and distributor in the company's new head office.

The Northumberland-Durham Power Co., lessees of the Healey Falls power, will transmit power to Belleville and the cement mills, Deseronto, Napanee and Kingston; also to Port Hope and Cobourg and north to Hamlet, Norwood and the Blairton iron mining district.

As a result of an unexplained explosion of the boiler in the Aylmer Electric Light & Waterworks, on October 12, Harry Fisher, the engineer, is dead, and the plant itself is a mass of wreck and ruin. The loss is estimated at $35,000, on which there is an insurance of $18,000.

Drayton electric light plant has gone under new management, the village, through the municipal council, having leased the entire plant. The present proprietor, R. O. Hube has been engaged to run the machines and do all the work in connection with installing new lights.

In accordance with the recommendation of Prof. Herdt, of McGill University, the Winnipeg Street Railway has opened the first of three sub-power stations. It is hoped by these and by bonding the rails, to reduce the danger to water mains and gas pipes from electrolysis.

The Toronto Board of Control has decided on the recommendation of Electrical Engineer Aitken and City Engineer Rust, to arrange with the Hydro-Electric Power Commission for the installation at the city's distributing station of sixteen feeder switches at a cost of $2,000 each.

"We expect to have hydro-electric power in Toronto, Preston, Hespeler, Galt and Berlin in March next," said P. W. Sothman, chief engineer, of the hydro-electric commission, the other day. "The construction work is going ahead fast." Woodstock will have the power by May.

E. I. Sifton, electrical engineer, is preparing plans for an underground system at London for the transmission lines of the Hydro-Electric Commission. The cost of the underground system is estimated at approximately $70,000. The poles of the London Electric Co. are said to be useless for hydro-electric purposes.

The Kaministiquia Power Co., which is controlled by Holt & Co., is increasing its power at Fort William so that in the future it will be in a position to dispose of 21,000 horse-power instead of 14,000 as at present. This is accomplished by adding one more Penstock at the power house at Kakabeka falls.

The Power, Light and Heat Committee, of Regina, have decided to recommend the city council to adopt a reduced scale of charges for electric power. The electrical engineer in his report stated that the greater the output the less would be the cost per k.w. hour. Last year the plant was run at a 10 per cent. loss.

Tenders have been called for the construction of five sub-stations along the line of the British Columbia Electric Railway from New Westminster to Chilliwack. The buildings are to be of concrete construction, and will be used for the distribution of light and power to the surrounding districts as well as in connection with the operation of the tram system.

The Burrard Power Co. has received from the Dominion Government a grant of 25,000 miners' inches of water on Lillooet river. Under the terms of the grant the harnessing of the waters of the Lillooet will be commenced at no distant date, and as the power plant will be only 23 miles from Vancouver, it is declared that it will not be long before some sections of industrial Vancouver will be drawing power from the source.

When Port Arthur officially approves the contract submitted by the Kam Power Co., through the Hydro-Electric Commission it is probable that the contract between the company and Fort William will be revised downward. The contract provides that Port Arthur shall pay a maximum rate of $17 per h.p. and that the minimum shall be $14, which shall be the price charged after 5,000 h.p. shall be used daily. Fort William is at present paying $25 per horse power delivered at the city substation.

Planing Mill News.

The Peterborough Lumber Co., opened their new mill last week.

A large planing mill will be erected at Montreal by Friedman Bros.

A new sash and door factory is to be built at Victoria, B.C., by Burdick Bros.

A large planing mill is being erected at Hamilton by the Burton-Baldwin Mfg. Co.

The Beaver Lumber Co. have purchased a site at Portage la Prairie for the extension of their plant.

P. J. Noel, Merrill, Wis., proposes establishing a large factory for woodenware at Fort Frances.

The Robinson & McKenzie Lumber Co. will erect a mill at Kamloops, B.C., if a site can be secured.

Donaldson's sash and door factory at Almonte, Ont., was destroyed by fire last week. Loss about $6,000.

Stephen Bros.' sawmill, at Windsor Junction, N.S., with all its machinery was recently destroyed by fire. Loss, $8,000.

Work will be commenced almost immediately on the rebuilding of the Niagara Falls planing mill, Niagara Falls, recently destroyed by fire.

Work has been started on the foundation of the new Camrose, Alta., planing mill. The building will be rushed to completion as speedily as possible.

The B. F. Graham Lumber Co. has announced its intention of constructing at Victoria, B.C., in the near future, a sawmill with a daily capacity of 100,000 feet.

The American Finance and Securities Co., New York, have purchased C.P.R. timber lands on Cowichan Lake, B.C., and will erect a large mill, spending $1,000,000 on development.

If a site can be secured, the Cranbrook mill people will erect a plant costing over $100,000 at Kamloops, B.C. In addition, they will also put in a sash and door factory and a casket factory.

The new shinglemill being built on Lulu Island for the Westminster Shingle Company will commence operations shortly. The mill will be one of the most modern of the kind in British Columbia.

William Currie & Co. have sold their mill property and timber limits at Charlo, N.B., to the Credit Foncier Canadien, of Providence, R.I. The business will be run as formerly and a large mill will be erected to manufacture spruce.

J. C. Campbell, of Vancouver, and J. C. Laidlaw, of New Westminster, have purchased the sawmill of R. McAllister & Sons, six miles south of New Westminster, for $15,000. The sawmill has a capacity of 20,000 feet of lumber daily.

The interests controlling the Berlin Mills property in New Hampshire are planning to instal a print paper mill plant at La Tuque, Que. It is also reported that the International Paper Co. has prepared plans for numerous mills in Canada.

It is estimated that the mills in the Georgian Bay district will cut 550,000,000 feet the present season. The Spanish Boom & Slide Co. will handle a total of about 150,000,000 feet of logs. The season has been favorable for log rafting, as there was a good stage of water for driving purposes in the spring.

The new sash and door factory of the Robt. Bisset Co., at Strathcona, Alta., has been put in operation and the machinery is now running under a full head of steam. The new factory is situated on the site where stood the previous buildings which suffered total destruction by the several unfortunate fires of the last few years.

The Nepisiquit Lumber Co., composed of some of the wealthiest lumbermen of the United States, closed a deal last week, whereby they take over the control of the extensive properties of the Adams, Burns Co., of Bathurst, N.B. The purchase includes all the lumber, crown lands and milling properties, as well as the wharves and stores at Bathurst village. The price paid is said to have been several hundred thousand dollars. A large and modern lumber mill is to be erected in place of the present buildings and it is also possible that a pulp mill may be established.

Trade Notes.

The Dominion Foundry Supply Co., Montreal, have secured the exclusive Canadian agency for the Peerless brand portable electric tools manufactured by the Cincinnati Electric Tool Co., Cincinnati,, O.

Chas. S. Ferry, formerly chief engineer Windsor Hotel, Montreal, and Sam. McCrudden, of the Peck Rolling Mills, have formed a partnership under the name of Ferry & McCrudden Co., 264 St. James St., Montreal. They have been appointed eastern agents for the Standard Engineering Co., Toronto, and will handle Standard Crown values, Cyclone grates, etc.

Kilmer, Pullen & Burnham, Toronto, have received an order from Calgary for 4—750 k.v.a. water cooled step-down transformers for the Calgary Power & Transmission Co. They have also received from Toronto an order for one 650 k.w., 120 r.p.m. engine type alternator, together with switchboard, steam driven exciter and motor generator set. Kilmer, Pullen & Burnham are Canadian representatives of the General Electric Mfg. of Sweden.

A recent Montreal business amalgamation was that of the Canadian Appraisal & Audit Co., with the Canadian branch of the American Appraisal Co. The name of the new company will be the Canadian-American Appraisal Co., Ltd. This combination of these two companies ensures to the public the highest possible service at a minimum cost, on account of the joining together of the forces of experts which made up the two separate companies. The new Board of Directors consists of John L. Moon, president; F. W. Cooper, vice-president; F. M. Lloyd, general manager; Hon. Lionel Guest; and L. W. Just, secretary-treasurer. The head office of the company will be in Montreal, at 4 Hospital Street, the old home of the Canadian Co. Mr. H. S. Snead will be the manager of the Montreal office.

Gas Items.

A company of Lethbridge men will bore for gas in the vicinity of that city.

English prospectors have struck natural gas at a depth of one thousand feet in Albert county, N.B.

The Barrie Water and Light Commission have awarded to the Crossley Bros., of Manchester, England, at $4,332, f.o.b. Liverpool, the contract for a gas-producing plant for the water and light station.

Representatives of the Maritime Oilfields Co. discussed with the Moncton, N. B., civic authorities the question of natural gas supply for that city. There are indications of gas in large quantities about that place.

The Montreal Light, Heat and Power Co. have taken out a building permit for the construction of a new office and valve house at the gas works to cost $8,500; and also an alteration permit for adding a storey to another building there, to cost $3,000.

The Sterling Gas Company have paid over the money in the purchase of the plant and franchise of the Mutual Natural Gas Company, at Port Colborne, and are now in full possession. Manager C. E. Steele states that they will have some forty wells in all and will be able to give a good service.

Wm. Mackenzie said that if Port Arthur and Fort William would lay the mains and enter into a contract with him he would instal ovens at the Atikoken furnaces and supply gas. He could not say at what price gas could be supplied until the matter had been investigated, but was sure it could be furnished at a price much below that which a regular gas company would have to charge.

The installing of a gas plant at Regina city was one of the questions briefly discussed by the Power, Light and Heat Committee recently. The committee were agreed in the opinion that the city should retain ownership of the plant, as it was an asset that would pay from the start and the chairman thought the city should not grant a franchise to any company, but should advertise for tenders to instal the plant and run it themselves.

Eugene Coste, mining engineer, Toronto, who is consulting engineer for the C.P.R., in the drilling operations being conducted for gas and oil along its lines in Southern Alberta, discussed with the Red Deer Board of Trade the likelihood of getting natural gas at Red Deer. Mr. Coste did not doubt but that natural gas could be got at Red Deer if they went down far enough, but he believed they would have to go down 3,500 or 4,000 feet, at least, to strike a permanent and adequate supply and the cost would be prohibitive; it would be very difficult to give any estimate of the cost, but it would go, probably $100,000 or more, as he could not be sure they would reach it at 4,000 feet. He doubted whether any large seams of coal could be found in the tetiary rock underlying Red Deer.

General Manufacturing Notes.

The Sydenham glass factory at Wallaceburg is in full operation again.

The Northern Pyrites Co. will likely build a large ore dock at Fort William.

A branch factory of the Steel Shoe Co., of Racine, Wis., will be established at Toronto shortly.

The Crawford Handle Factory at Tilbury, is running night and day in the effort to keep pace with orders.

The Hamilton Sewer Pipe Co. are looking over Medicine Hat, preparatory to locating a factory in the west.

R. Smith & Company's candy plant, at Victoria, was completely destroyed by fire last month at a loss of $20,000.

Another story will be added to the Ogilvie flour mills at Fort William, and the Kaministiquia Power Co.'s plant at the same place will be doubled.

The David Craig Co., Boston, Mass., capitalized at $1,500,000, and manufacturing concrete-block houses, will establish a branch plant at St. John, N.B.

A gang of workmen are busy making alterations at the factory of the Dominion Mfg. Co., Galt, which, when completed, will double the size of the present premises.

A company subsidary to the Sydney Cement Co. has already commenced construction upon a plant for the manufacture of brick from Dominion Iron & Steel blast furnace slag cement.

The Dominion Tar and Chemical Co. are increasing their plant to the extent of nearly double their present capacity, with a view to taking care of the increased output of crude by-products, the result of the expansion at the steel plant at Sydney.

A company has been formed, financed by Victoria and British capitalists, and with half a million dollars subscribed for the purpose of establishing works for the manufacture of Portland cement at the property known as the Rosebank lime quarries, Esquimalt harbor.

W. J. Lindsay, the man who is interested in the locating of a wagon and carriage manufacturing plant at Port Arthur, says his plant will be established shortly. "There is sufficient business contracted for to give employment to' says Mr. Lindsay, "from 125 to 150 men all the year round."

Application for incorporation has been made to the N. B. Provincial Government by William McAllister, of Moncton, and others, as the Empire Steel Ladder Co. Mr. McAllister secured a patent on this ladder in May, 1908, and it is the intention of the company to manufacture and sell the ladder, and also other minor flexible steel articles, and to carry on a business as founders, with a capital stock of $24,000.

F. C. Durant, who is looking over possible sites for the establishment of a sugar refinery is very favorably impressed with St. John as a location on account of its being on the sea coast and also having excellent rail facilities. He says his company would operate under a Dominion charter, and would be capitalized at $2,500,000. The plant to be erected would cost in the vicinity of $2,000,000. About 300 hands would be employed.

The Westmoreland copper mine, at Dorchester, N.B., one of the richest in the province, was sold by the Maritime Exploration Co., to L. Vogelstein & Co., of New York, one of the largest copper concerns in the world. The new owners announce their intention of beginning work at once on a large scale, for the development of the mine, and expect in the near future, should results prove satisfactory, to erect a concentration mill with a capacity of 1,000 tons of ore daily. This industry would afford work for about 500 men.

Building Operations.

The Hamilton Cotton Co. will rebuild its dye house.

The Witness Publishing Co., Montreal, will rebuilt at once.

W. E. Sanford Mfg. Co., Hamilton, will build a model factory.

The Cudahy Packing Co. will build a $17,000 factory at Toronto.

The Walters Axe Co. are building an addition to their plant at Hull.

The Tuckett Tobacco Co. will build an auxiliary factory at Hamilton.

The Western Soap Co., Vancouver, will erect a new and modern factory.

The C.P.R. contemplate erecting a 250,000 bushel elevator at Vancouver.

The F. W. Bird Co. contemplates making an addition to its Hamilton plant.

The addition to the Meriden-Britannia Co.'s Hamilton works is being pushed.

The Toronto Board of Education will erect a $40,000 school on Avenue Road, that city.

Plans have been approved for the $1,500,000 extension to the C.P.R. Windsor station at Montreal.

J. B. Lusby, Amherst, N.B., has the contract for building a new factory at Sackville, for the A. E. Wry Co.

Land has been purchased in Hastings townsite, Vancouver, with a view to the erection of an isolation hospital.

G. F. & J. Galt have been granted a permit for a warehouse, six storeys high at Winnipeg. The cost is $65,000.

A by-law to raise $25,000 for the erection of a new school building will be submitted to the Meaford ratepayers.

The Thompson-Macdonald Co., Cobourg, will erect a new building of three storeys next to their present premises.

V. Williamson has been given the contract to build a laboratory building at Walkerville for the Geo. H. Rundle Co.

The contract for the construction of the Masonic Temple at Prince Albert has been let to A. Anderson, at $60,000.

The contract for the erection of the Tobin Arms Company's new plant at Woodstock, was awarded to W. J. Taylor.

A site has been purchased at Regina by Whitmore Brothers, upon which they will at once proceed to erect a theatre.

The Imperial Auto Co., have purchased a site at Toronto on which they intend to erect a large building immediately.

A permit has been granted to the Rookery Building Co. to erect at Winnipeg a three storey block to cost $155,000.

A by-law granting J. W. Ford $10,000 to erect a flour mill and elevator at Swift Current, was carried by the ratepayers.

The Grand Trunk will shortly commence work on a considerable enlargement of their freight sheds at Turcot, west of Montreal.

It is learned that work on the new $100,000 hospital to be erected by the Grey Nuns at Regina, will be commenced as soon as the trunk sewer is down.

The Lyall, Mitchell Co. have been awarded the contract for the new warehouse and office building of the Gutta-Percha Rubber Co., to be erected at Winnipeg.

The new plant of the Tudhope Carriage Co., at Orillia, which is to replace the one destroyed by fire late in August, is more than two-thirds built. The cost will be $120,000.

A syndicate of British and Toronto capitalists have purchased 350 acres just outside the latter city. The intention is to lay the property out in avenues and squares for high class residences.

The Alberta Pacific Elevator Co. propose erecting four elevators at Vancouver, each capable of holding 250,000 bushels of grain. This company already owns 90 elevators and warehouses in Western Canada.

It is proposed to have a new and modern market on a new site at Brantford and to have new Government and city buildings combined on the present market square. The latter is estimated to cost $250,000.

The Board of Trustees of the General and Marine Hospital, Owen Sound have decided to build an addition to their institution. The annex will cost between $12,000 and $15,000, and will double the present accommodation.

The congregation of Bonar Presbyterian Church, Toronto, authorized an architect to draw up plans for a church to cost $40,000, with a seating capacity of 1,000. Work upon the new edifice is expected to commence early next spring and the building to be completed in a year's time.

The Toronto Board of Control having approved of the site purchased by the Board of Education for the new Northwest High School, the work of building will go on at once. Excavations will be begun this fall, and by the opening of the fall term next year, the new $150,000 High School building will be ready for occupancy.

Work has been started on the excavations for the foundation of the first permanent building for the new asylum to be built in Coquitlam, B.C., near Westminster Junction. The building will be an exceptionally large one, and will cost nearly $400,000, and will accommodate 600 patients. Five other buildings in all will be added later, but they may not be completed for some years.

New Companies.

Star Shoe, Ltd., Montreal; capital, $20,000; to manufacture boots and shoes. Incorportors, J. B. Hurteau, V. Labonte and Z. Lacasse, Montreal.

Carriage Factories, Ltd., Montreal, capital, $4,000,000; to make vehicles of all kinds. Incorporators, G. P. Grant, A. J. Brown and F. G. Bush, Montreal.

Natural Enamelware, Toronto; capital, $1,000,000, to manufacture enamel wares. Incorporators, J. H. Carter, H. C. Secord and R. B. Young, Toronto.

Eastern Construction Co., Toronto; capital, $40,000; to carry on contracting and building business. Incorporators, A. Mullin, G. Service and J. L. Wood, Toronto.

The Peerless Heater Co., Toronto; capital, $40,000; to manufacture and sell boilers and hot water heaters. Incorporators, A. Dods, G. Grant and R. P. Stockton, Toronto.

Buckingham Graphite Co., Toronto; capital, $150,000; to develop and treat ores, minerals and metals. Incorporators, W. W. Dunlop, R. H. Cuthbert and S. Linn, Toronto.

Jacobs Asbestos Mining Co., Montreal capital, $3,000,000; to mine and work asbestos and other minerals. Incorporators, F. Lewis, A. McReaper and A. Charters, Montreal.

British Canadian Lumber Co., Montreal; capital, $2,000,000, to engage in sawmilling and lumbering. Incorporators, E. F. Surveyer, G. V. Cousins and C. A. Hale, Montreal.

The Western Sugar Refining Co., Toronto, capital, $1,500,000, to manufacture and refine sugar. Incorporators, J. R. L. Starr, M. C. Cameron, and A. S. Grant, Toronto.

Tobin Arms Mfg. Co., Woodstock, capital, $100,000; to manufacture firearms and metal specialties. Incorporators, K. Harvey, H. A. Little and A. J. McIntosh, Woodstock.

Vogel Co. of Canada, Montreal, capital, $20,000; to manufacture automatic sprinklers and fire extinguishers. Incorporators, J. J. Keys, Jno. Ogilvy, Montreal, and A. H. Chave, Westmount.

The Sterling Electric Supply Co., Toronto; capital, $25,000; to manufacture electric supplies, fittings and machinery. Incorporators, A. G. Manly, R. W. Strickland and P. W. Greene, Toronto.

Montreal Safety Gas Machine Co.; capital, $100,000; to manufacture gas-producers, machinery, ranges, heaters, burners, etc. Incorporators A. J. Brown, R. O. McMurtry and G. P. Drennan, Montreal.

The Bow Centre Collieries, Ottawa, capital, $3,000,000; to carry on mining, milling, reduction and development business. Incorporators, W. P. McAllister, A. W. Fraser, and W. C. Perkins, Ottawa.

The Woltz Moulding Mfg. Co., Toronto; capital, $20,000; to manufacture picture frames, art furniture, room mouldings and artists' supplies. Incorporators, Geo. Woltz, Alf. Jones and G. E. Alexander, Toronto.

Canada Pottery Co., Iberville, Que.; capital, $90,000; to manufacture sanitary porcelain baths, lavatories and all kinds of pottery. Incorporators Alb. Clayton, O. Couturier and Arthur Clayton, Iberville.

Windsor Superior Mfg. Co., Windsor; capital, $40,000; to manufacture and deal in wares of every description composed of wood and metal. Incorporators, W. Bong, Jno. Atcheson Smith, Windsor, and S. T. Allen, Detroit.

Tuttle & Bailey Mfg. Co., Bridgeburg, Ont., capital, $40,000, to manufacture and deal in heating and ventilating supplies. Incorporators, C. H. Tuttle, Englewood, N.J., J. H. Bailey, Brooklyn, and Robt. Kelting, Chicago.

A. Matthews, Ltd., has been incorporated at Toronto, with a capital of $30,000 to take over the manufacturing of roofing and sheet metal material business carried on by Asa Matthews. The incorporators are Asa Matthews, John O'Donnell, Israel Morin and W. N. Downs.

At Hartland, N. B., a company has been organized and will apply for incorporation as the Hartland Concrete Block Co., for the purpose of manufacturing concrete goods of every description, especially concrete blocks for building purposes. The officers of the company are Dr. W. DeC. McIntosh, president; A. G. Baker, vice-president; Arthur Dickinson, managing director, and J. B. Daggett, secretary-treasurer.

The Windsor Superior Mfg. Co. is the name of a new concern formed at Windsor, Ont., for the purpose of manufacturing a patent can opener, which has been on the American market for some six or seven months. S. G. Allen, of Detroit, is patentee, and the new company possesses the sole Canadian rights. The American branch is in Detroit. The Canadian company is capitalized at $40,000, Walter Boug being president.

Addition to Dunlop Rubber Works.

An addition to the rubber works of the Dunlop Tire and Rubber Goods Co. has been commenced. The addition will be erected to the north of the present factory on Booth Avenue. The new building will be completed, and plant installed, by December next. It will be devoted to the production of automobile tires and mechanical rubber goods.

Extension of Dominion Iron and Steel Co..

The Dominion Iron & Steel Co., of Sydney, N. S., has closed a contract with the Canada Foundry Co., Toronto, for the construction of an additional blast furnace, an extension to the Bessemer plant, and two 50-ton open-hearth furnaces of the new type, and for the carrying out of the new process in making open-hearth steel. The amount involved is upwards of $500,000. The steel company will also build an additional rod mill, two merchant mills and another mill for the production of finished material.

National Iron Works, Toronto.

The National Iron Works Co., which has just purchased from Toronto a site on Ashbridge's marsh, was awarded a large contract for cast-iron pipe by the Board of Control of that city. The company's tender was an unexpected one, as it was not supposed that it would take contracts until its big foundry in the marsh is built. "The day after the city conveyed the property to the National Iron Works Co. men were set to work upon the building of the foundry," said Cawthra Mulock, president of the company. The contracts, he said, all call for the completion of the works by February 16 with heavy penalties for failure to finish the work in time. The work will be pushed even in the cold weather. The work called for in the contract of yesterday will be done at the National Iron

Works. The tender calls for the supply of 1,080 lengths of pipe for the water services to the new districts, at $27.45 per length of pipe.

Standard Sanitary Co.

The Standard Sanitary Mfg. Co., Pittsburg, have concluded a deal for the purchase of a site for their new factory at Toronto. The property comprises 7¾ acres, and embraces the block of land from Lansdowne Avenue to the G.T.R. tracks and from Royce Avenue to Lappin Avenue.

The land was purchased from the Canada Foundry Company for $5,000 an acre, making about $40,000 in all. The location is immediately south of the Canada Foundry Co., and a short distance west of the Dominion Radiator Co.'s works. It is also about half a mile immediately north of the King Radiator, Somerville Brass and General Brass factories.

"We will be enameling bath tubs in six months and making a full line of our goods inside a year," said W. A. Porter, manager of the Standard Sanitary Co.'s jobbing business at Toronto. "Our people have built a number of plants in the United States and we are in a position to build and instal the necessary machinery quickly."

James Riordan, it is expected will be manager of the new plant.

Car Shop Merger.

N. Curry, president of the new Canadian car merger, which will be officially known as the Canadian Car & Foundry Co., in an official statement regarding the completion of the consolidation makes the following announcement :—"The new company's capital will be as follows : $3,500,000 of six per cent. bonds ; $5,000,000 of seven per cent. preferred stock ; $3,000,000 of common stock.

"The companies being secured with their capital are as follows :—Rhodes-Curry, $1,850,000 preferred stock, $1,000,000 common stock ; Canada Car Co., $1,000,000 preferred stock, $2,000,000 common stock ; Dominion Car & Foundry Co., $3,510,900 common stock. The officials of the new company will be ; N. Curry, pres. ; W. W. Butler, 1st vice-pres. ; N. S. Reeder, 2nd vice-pres. The first board of directors will include James Redmond, director of the Royal Bank ; T. J. Drummond, pres. of the Lake Superior Corporation ; Wm. Aitken, pres. of the Royal Securities Co. ; Mr. Z. A. Lash, K. C., of Toronto, director of the Canadian Bank of Commerce. The head office will be in Montreal. The purchasing agent will be A. H. Chabe, and J. A. Skelton will be secretary-treasurer.

NEW CATALOGUES.

CUTTING MACHINES.—The George Gorton Machine Co., Racine, Wis., are distributing a 16-page, 8½ x 11½ inch catalogue, descriptive of their new heavy duty cutting off machines, illustrated in November Canadian Machinery. A two-page insert gives very complete records of tests made on these machines by disinterested parties and users.

GRINDING WHEELS.—The Norton Co., Worcester, Mass., manufacturer of Alundum grinding machinery, etc., is sending to the trade a booklet entitled "Facts Worth Knowing About Grinding Wheels." Their method of manufacture is briefly referred to, and rules are included for obtaining surface speeds, calculating speeds and diameters of pulleys, etc.

BRASS FOUNDRY ALLOYS.—The United States Alloys Co., Baltimore, Md., manufacturer of metals, alloys and fluxes, is sending to the trade a 6-page folder describing fluxes for brass foundry use. Flux No. 1 cleans the metal bath and converts the impurities into a fusible slag which rises to the surface and can easily be skimmed off. No. 2 flux has essentially the same action as No. 1, but is somewhat milder, and is preferred by some brass founders as it can be used in somewhat larger quantities, approximately one half pound per 100 pounds of metal. No. 1 flux is neutral in its action, whereas No. 2 is slightly acid. This concern also manufactures manganese-copper, silicon-copper, manganese silicon-copper, ferro-silicon, ferro-manganese, as well as other deoxidizers and alloys for saw, giving particulars regarding speed, etc.

CUT-OFF SAW.—A pamphlet from Kellogg & Co., 196 King St. West, Toronto, describes the John H. Hall & Sons No. 1 cold saw, which Kellogg had on exhibition at the Canadian National Exhibition. The circular describes the saw giving particulars regarding speed, etc.

CRUCIBLE FURNACES.—Natural draft crucible furnaces, built by the J. D. Smith Foundry Supply Co., Cleveland, O., are described in a 14-page catalogue recently issued by this concern. Numerous views are included showing various installations and a list of users is also given. In a 4-page pamphlet published by this concern, the Cleveland squeezer is described, while another pamphlet is devoted to the Cleveland Jr. core oven, which is semi-portable, and is provided with rolling drawers. It can be heated by either coke, coal, oil or gas.

B.C. ELECTRIC RY. LOCOMOTIVES.

The electric locomotives have been built by Dick, Kerr & Co., for the B.C. Electric Railway Company.

The locomotives are of the articulated truck four-axle type, with one motor mounted upon each axle. The mximum rated tractive effort is 16,000 lb. drawbar pull, and the maximum instantaneous effort is 25,000 lb. A feature of special interest in the truck arrangement is that the body of the locomotive rests upon two four-wheeled trucks coupled together by a massive hinge having lateral flexibility but vertical rigidity, thereby enabling the rear trucks to resist any tendency to tilt under the action of the forward truck, and vice versa. The centre pins and cab platform framing are not subjected to any longitudinal stress, except that due to its own inertia when starting and stopping, the whole pull of the motors being transmitted direct from the motors through the trucks.

The motor equipment consists of four Dick-Kerr 12a motors. When operating on a 600 volt circuit each motor will give a tractive effort of 4,040 lb. on the periphery of the 42 in. wheels, and a speed of 15 miles per hour at the one-hour rating. Each motor is fitted with reduction gear having a ratio of 3.54 to 1. The armature bearings of the motor are lubricated by oil rings, which are specially designed to prevent flooding when running at high speeds. The axle bearings are lubricated by a system of wicks which are immersed in oil wells.

The motors are designed and arranged for forced ventilation, the air being blown into the motor shell at the end farther from the commutator, and passing out at suitable openings provided at the commutator end.

In addition to the blower for the motors, there is an electrically driven air compressor with suitable air reservoirs for the air brake equipment, the locomotive being fitted with combined straight and automatic air brake. The compressor for the brake equipment is mounted above the motor driven blower in the cab. Two current collectors are provided, these being of the straight under running trolley type, the current being collected from an overhead trolley line. The trolleys are equipped with retrievers.

Chapman & Walker, corner Victoria and Lombard Sts., Toronto, are Canadian agents for Dick, Kerr & Co.

THE HAMILTON TECHNICAL SCHOOL

The opening of Hamilton's new technical school marks an advance in technical education in Ontario and in the industrial centre in which it is situated. The staff is well selected and the equipment is excellent. In Hamilton are large steel works, electrical plants and manufacturing industries of various kinds. It is expected that these concerns will draw their apprentices from the technical school. The technical school will not make skilled workmen, but it will supply boys who are familiar with tools, who have some manual facility, and who have learned the necessity of observation and accuracy. The courses will include classes in English, arithmetic, algebra, physics, drawing, woodworking, electricity, forging and machine shop practice.

The school is situated on Stinson St., and will be directly under the control of the Board of Education. The course of study in the classes mentioned have been arranged for the first year and will also be arranged for second and third year students.

Evening Classes.

The evening classes are intended primarily to meet the requirements of apprentices, journeymen and others who are engaged in industrial or commercial pursuits during the daytime by providing mathematical and scientific training and supplementary shop practice. The practical breakdown of many of the apprentice systems has been one of the principal reasons for the establishment of industrial and technical schools. The session began early in October and will end in May. Instructions are given on Monday, Wednesday and Friday evenings.

Evening Courses are given in the following subjects:—

Carpentry and Building Construction.
Pattern making.
Algebra.
Plane Trigonometry.
Industrial Chemistry.
Industrial Design.
Graphic Statics.
Architectural Drawing.
Freehand Drawing, Mechanical Drawing.
Printing.
Plumbing.
House and Sign Painting.
Textile Design and Manufacture.
Domestic Science.
Dressmaking.
Millinery.

Fees.

For day classes the fees are $1.00 a month for residents of Hamilton and $3 per month for non-residents.

For evening classes the fees are $1 per month for residents and $5 per month for non-residents. Fees are payable in advance. The above fees admit pupils to all classes.

Pupils are required to provide themselves with drawing instruments, paper and a few tools, and with overalls for use in the shops. Drawing boards and T squares are provided by the school.

The Building.

The Technical School is a brick building, with brown stone trimmings. It is a two-story structure, with basement and attic. In the basement, which is high and well-lighted, are located the forge department, the electrical laboratory, the painting and plumbing departments, fan room, store rooms and lavatories. On the first floor are to be found the office, the woodshop, the machine shop and class-rooms; on the second floor, the domestic science department, the drafting room and class rooms. The building is heated by steam. A complete ventilating system has been installed.

Entrance Requirements.

Those elegible for admission are:—

(A) As regular students—(1) pupils who have passed the entrance examination; (2) those whose standing is equivalent to High School Entrance, on the joint approval of the Inspector of Public Schools and the Principal of the Technical School.

(B) As special students—others whose qualifications are satisfactory to the Inspector of Public Schools and the Principal of the Technical School.

A three years' course is offered. In the first year the student's time is divided about equally between the academic and the technical work; in the succeeding years increased attention will be given to the technical work.

Forging.

The forge shop is a room 84 feet by 28 feet, located in the east side of the basement. Besides benches fitted with blacksmiths' vises, it contains 16 Sheldon forges with blast and exhaust system and a full complement of Peter Wright anvils and small tools, including flat and round jawed tongs, swages, fullers, hardies, sledges, hot and cold sets, flatters, hammers, dividers, calipers and wrenches. An additional line of tools is provided for special work.

Course 1—5 months—Instruction in the making and managing of the fire; fuel; tools used in hand forging; iron and iron

working; welding; explanation of the different heats; tempering. Practical instruction in drawing down, bending and welding. Simple exercises, including the making of hooks, staples, rings, bolts, chisels, lathe tools, etc. Working drawings are used throughout the course.

Machine Shop Practice.

The equipment of the machine shop, which is a well-lighted room, 84 feet by 28 feet, consists of eleven benches furnished with Holland's vises and individual sets of tools, 1 high speed and 6 engine lathes of from 11 inches to 16 inches swing, a 24-inch by 24-inch by 6-foot planer, a 16-inch, London Machine Tool Co., Hamilton, back geared shaper, a 20-inch drill press with hand and power feed, a Robertson Drill & Tool Co., Buffalo, power hack saw, a Canadian Hart Wheel Co., Hamilton, grinder and a Fox, Grand Rapids, milling machine, besides a tool room stocked with a line of special tools.

Course 1—5 months—An elementary course. Frequent talks on shop methods and the use of the various tools and machines with which the shop is equipped. The bench work includes the operation of chipping, filing, polishing, scraping, tapping and threading. After this a number of exercises are undertaken, which involve the use of the machines enumerated above. Working drawings are used throughout the course.

Electricity.

In the course in electricity emphasis will be put on the laboratory practice, but the theory and mathematics of the subject will not be overlooked. The laboratory is a room 78 feet by 28 feet, situated on the west side of the basement. It is equipped with sets of magnets, galvanoscopes, resistance boxes, D'Arsonval galvanometers, Wheatstone's bridges, batteries of various types, and other apparatus for individual experiments in elementary magnetism and electricity; doorbells, annunciators, switches, sockets, receptacles, incandescent lamps of carbon, tungsten and tantalum types, and arc lamps, for practice in wiring and testing; and for testing generators and motors a full line of ammeters, voltmeters and wattmeters, and generators and motors of various types.

Course 1—An elementary class-room and laboratory course in magnetism and electricity, covering magnetic lines of force, simple voltaic cell; electrochemical series; two-fluid cells of various types; Ampere's law; Ohm's law; measurement of resistance by various methods; law of divided circuits; battery resistances; heating effect of current; induced currents; construction and operation of simple dynamo; electric bells; electroplating; electrostatics series.

Woodworking.

The wood shop is a large well-lighted room 98 feet by 28 feet, equipped for bench and machine work. There are twenty-four benches furnished with vises, saws, chisels, gauges, planes, mallets, dividers, ratchet braces and bits, rules, etc., for the commoner operations in carpentry cabinet making and pattern making. The list of machines includes 2 wood turning lathes of 12-inch swing and 5-foot bed, four 14-inch swing and 6-foot bed, with a full complement of wood turning tools, including gauges, chise's, scrapers, inside and outside calipers, etc.; rip and cross-cut power saw with tilting table and bevelling attachment; a 30-inch band saw with tilting table; buzz planer, with adjustable table; and power grindstone.

Course 1—5 months — Instruction in the growth of trees and the preparation of lumber, the properties of the commoner woods, and the uses and care of wood working tools. The shop excerises will afford practice in planing, sawing, etc., the making of joints used in carpentry and cabinet work, and wood turning. The course will aim to develop the individuality of the student and, by practice, to familiarize him with the correct and accurate use of wood-working tools.

In the second and third years, courses in pattern-making and carpentry will be offered.

Both ordinary and Chapman double ball bearings are in use. Experiments will be made by the students with the two types.

The Teachers.

The principal is J. G. Witton, B.A., S. B., who will have charge of Mechanical Drawing; H. Nold, a mechanical and electrical engineer, will be instructor in electricity; William Bailey, in wood working; Frank E. Brancht, in machine shop practice, and Julian H, Thomas in forging. Other teachers have been appointed to take charge of art, domestic science, etc.

The Technical School has taken over the equipment of the Hamilton Art and Technical School, and this department will be under the supervision of J. S. Gordon.

THE TENSILE STRENGTH OF NICKEL STEEL.

Tests performed at the Institute for Testing Materials at the Darmstadt Technical High School have shown, according to Preuss (Stahl and Eisen), that the tensile strength of nickel-steel rivets is two to two and a half times as great as that of ordinary rivets, whilst the resistance to slip is not inferior to that of the latter. At high temperatures the breaking-strength of nickel steel is higher than that of welded iron; and this applies in a still greater degree to the elastic limit. Hence during the cooling of nickel-steel rivets after being hammered up, the pasty condition of the metal ceases at a higher temperature than in the case of welded iron, so that elastic stresses are set up at an earlier stage. Superheating, followed by slow cooling, lessens the capacity of nickel steel to withstand repeated bending at right angles and re-straightening; but even after exposure to white heat the flexion value was 1¾, which may be considered satisfactory for boiler-plate steel. Still higher temperatures cause the flexion value to rise again.

It is essential that the difference of potential between nickel-steel rivets and the plates they are intended to hold together should not be too great. In order to study the influence of electrolytic decomposition a number of nickel-steel rivets and welded-iron rivets were driven through separate plates of mild steel and immersed for two months in a brine corresponding to sea water. The loss of weight sustained by the nickel-steel rivets was in the proportion of 11 to 6 as compared with the loss sustained by rivets of iron, and further experiments showed that the difference of potential between nickel steel and mild steel is greater in brine and tap water than that between welded iron and mild steel.

TARIFF CHANGES BY ORDER-IN-COUNCIL.

An order-in-council from Ottawa has been made transferring to the free list the following:

Metallic elements and tungstic acid when imported by manufacturers for use only in their own factories in the manufacture of metal filaments for electric lamps.

Steel imported by manufacturers for use in their own factories in manufacturing rough unfinished parts of rifles, when such parts are to be used in rifles to be made for the Government of Canada.

Gun barrels in single tubes, forges roughbored.

Hyposulphite of Soda when imported by tanners for use in their own factories in the tanning of leather.

Rolled iron and steel rods, not over half an inch in diameter or in width, to be manufactured into horse shoe nails, when imported by manufacturers for such nails.

Laboratories, etc., in the Hamilton Technical School, Hamilton.

Costs that Wore Masks; Story of a Factory System

Richard Bracefield, in System, Relates this Story of a Factory System in which Expenses Masqueraded with Bankruptcy.

"Mr. Newhall wants you."

Crosby was under a lathe when he got the peremptory summons. Delving in grease and steel dust, he was attempting to coax a worn-out machine to do the impossible. In no amiable mood he crawled forth.

"All right," he answered sharply. "Guess he can wait until I clean up."

He crossed to a faucet but, changing his mind, followed the messenger. "The old man may as well know that this is no collar-and-cuffs job," he muttered, surveying his begrimed hands. "If things go wrong, it's not because I supervise at long range."

Entering the president's office, he was conscious of a new, a sharper antagonism. For weeks—virtually for half his short service with the company—his relations with his chief had been growing colder, more formal. In the brusque greeting now, the invitation to be seated, he recognized the heralds of a crisis.

"When you came to us, Mr. Crosby," the elder man began, "it was with the idea that you would cut our making costs in your two departments, wasn't it? You were also to perfect our Model 7 and get out the machine tools for it. But the main reason you were hired was to reduce our production expense in your two shops. Your own estimate, you'll recall, was that it ran twenty-five to thirty per cent. too high."

The supervisor inclined his head. The other's trend was unmistakable; it remained only to hear the specific charge.

"Very well." Mr. Newhall chose a typewritten statement from the little pile before him and handed it to the younger man. "There's a tabulation of manufacturing accounts F and G for the three months you've been in charge and the three months preceding. How do you account for the extraordinary increases?"

Crosby compared the figures. On their face they were inexplicable. Yet he knew that, despite his inheritance of careless workmen and ill-kept machines, he had not done badly during his three months.

"Now then"—the president broke harshly in upon his swift analysis—"on top of this disappointing showing comes a requisition signed by you"—he waved it at the superintendent—"for the purchase of three expansion reamers to be bought outside.

"If that's your idea of cutting costs"—his voice rose in his excitement—"it's time we came to an understanding. You propose here to pay eighteen dollars apiece for these reamers when our books show that we've made them for eleven."

Crosby took counsel with himself. He had ordered the reamers because they were badly needed and the price seemed low. He had been in the plant long enough to discover that its accounting system held inscrutable mysteries. The exigencies of shops full of poor equipment had left him no time to master the riddle of his predecessor's cost system. The sheet in his hands—account F representing drills, taps, files, toolsteel and the like, the other jigs, templates, reamers and so on—showed an excess in costs during his incumbency of nearly one hundred per cent. without a corresponding increase in equipment. The figures did not reflect the facts; but he saw no way of demonstrating their falsity. Swiftly he framed his answer.

"I've given all my time to production, Mr. Newhall,"—he met his senior's eyes frankly—"you know our machines were in deplorable condition when I took hold, and discipline so lax nobody did good work. Those were concrete evils no one could mistake. I tackled them first and in a measure I've corrected them. But I don't understand why your figures here should indicate what I know isn't true.

"Give me a week to dig into the thing. If I can't satisfy you then that I'm getting out more work and getting it out cheaper than Fox did, I'll quit."

Mr. Newhall swung back to his desk and picked up the offending requisition.

"Have it your way." he said. "Meanwhile, you had better start to make these reamers."

II

Crosby hurried back to his office with a well-defined sense of his crisis. He had pledged himself to prove that departments R and X under his management had increased output and lowered costs. Failure meant a serious check, perhaps the end of his career as an executive.

He cast back over his three months' experience, recalling each change and correction he had made. He had been conservative in his betterments. Every machine tool that could possibly be used or repaired he had retained: he had limited repairs and new construction to imperative necessities, replacing no gauge or jig whose faults could be overcome by adjustment or extra vigilance on the part of the workman handling it.

In this he had gone even further than his own ideas of quality in product dictated because Mr. Newhall had vetoed nearly every suggestion involving outlay on new tools or machines. Admitting that the stock room was burdened with imperfect parts, the president had insisted that incompetent workmen and careless supervision were to blame—not the shop equipment. It was Crosby's job to correct these evils, he pointed out.

Reorganization of the force and restoration of equipment had been strenuous tasks. For keeping time and stock satisfactory systems were in use; but the methods of computing costs offered endless opportunity for error. Pay-rolls, drawings, patterns, machine tools and materials were charged to their proper accounts, it is true; the trouble lay in the overhead expense.

Both of Crosby's departments were distinct in output and radically different in the demands they made on power and non-productive labor from other departments of the business. Yet their share of the charge for interest, taxes, small tools, power, light, heat, insurance and repairs on buildings, clerical expenses and the like, was based on the general approximation used for all other departments. All these items were lumped in one account nominated shop expense and distributed by the easy but inaccurate method of charging against every job a fixed ratio of sixty-five per cent.

The new supervisor had questioned this procedure, since three other departments patently required more non-productive labor and tools than did either R or X. Newhall pooh-poohed his objection.

"What's the use fussing over red tape or chasing every penny to its rat hole?" he demanded. "Don't you lend and borrow men and tools from the other shops? To keep track of every transfer would mean big expense. It's all in the family, any way. You'll find plenty to occupy you in the making end. Leave the costs to us."

The sixty-five per cent. the president admitted, was no more than an approximation. "A little high, maybe," he said, "but good enough for all practical purposes."

Reviewing these circumstances now, Crosby remembered his distrust of such guesswork as against the cost systems he had been accustomed to, which reduced every item to tangible figures. Allowing for errors, he could not account for the extraordinarily low costs his predecessor had made in manufacturing accounts F and G. It was all the more mystifying in view of the many spoiled and unfinished gauges and jigs he had uncovered in the shops.

From verification of his own figures, he turned to analysis of the other man's. The accounting department was willing to help, but could throw no light on the matter

"You see," the head explained, "Fox took his costs from time cards turned in under order numbers, just as you do now. As fast as his clerk extended the

costs the cards were destroyed. Fox couldn't see any reason for keeping them and Mr. Newhall didn't care. Until you came, no one considered preliminary records important.

The "shake up" in R and X had included both foreman and time clerks. In his quest for information, Crosby was compelled to throw himself on Fox's generosity.

In vain. The former supervisor, now a job foreman in a neighboring factory, laughed at his successor's predicament.

"Up against it, eh?" he smiled in mockery. "Well, you were going to cut my making costs 25 or 30 per cent: go ahead and do it. If you're not smart enough to hold your own in that easy-going old asylum, you'd better go somewhere and take lessons. But not from me. I could put you wise, all right, but I'm not doing it."

The boast stirred anew the suspicion which had recurred again and again to Crosby. But he tried diplomacy. He urged that he had played no part in Fox's discharge: that they had a common interest in proving Mr. Newhall's cost system unfair and inaccurate; in bringing the autocratic president to confession of his errors. The foreman grinned and shook his head.

"Better hunt up Jim Williams," he suggested. "He was foreman and could tell you how we cut costs. He hasn't a job yet, but he'll be glad to see you. He had an idea that he lost his place through you."

III.

Find Williams; there was no other way. The foreman's threats had given Crosby little concern before this: now they loomed up as barriers to an understanding with the man. And an understanding was necessary; he had made search for Fox's clerks and the other foreman before appealing to his predecessor. Williams offered the last chance of clearing up the riddle within the week Newhall had granted; four days had already been consumed in fruitless investigations.

For the twentieth time, Crosby rebelled against circumstances. He was competent, faithful, skilled. He had proved his methods in other factories; he knew he had made the most of his materials, machines, men; that the tools he had made could not be duplicated with the same equipment for less cost. Fox had juggled his figures: Williams should explain how and why.

Telephoning to his wife and bolting a hasty lunch, he took a car to Williams' house. The foreman, sitting on the steps of his cottage, scowled as the supervisor turned in through the gate. Crosby lifted his hat to Mrs. Williams—a courtsey that saved him, perhaps, from instant attack.

"Go inside," the foreman commanded harshly. Without acknowledging the visitor's greeting, he sprang to his feet.

"You've got your nerve," he challenged, facing Crosby with clenched fists.

"Why?" the latter demanded boldly. In the car he had determined his course. "I've done you no harm. You can help me; I may be able to help you. I will, if I can."

"Help me!" the other sneered. "Yes, you will. You helped me out of my last job. And you'll settle for that right now."

"Go ahead," Crosby answered steadily. "If you've got any real grievance against me, here I am. But you know"—he sudenly took the offensive, hazarded all on the suspicion which had grown to conviction in the last hour—"that Fox got you in bad and that you signed your own pay-off when you helped him juggle his costs."

The thrust went home. Williams flushed.

"I didn't help him," he denied. "He was boss and could do what he pleased."

Masking his exultation, the supervisor pressed his advantage.

"But Newhall paid you for a square deal," he urged. "You couldn't expect to stick when they got next to Fox's little game."

"Say," the foreman blustered, "they'll need a new supervisor, if you don't mend your talk."

Crosby ignored the threat. His end was within reach if he could only win this man.

"Look here, Williams," he said, earnestly, "I'll give you a chance. Fox worked you for a catspaw, but I believe you've learned your lesson. You know your trade. You'd be a good foreman if you figured loyalty as the first thing you owe the house.

"I'll get you a bench job with my old company," he proposed. "I'll put you in right with the front office and after you've proved you're on the level, they'll start you up the lader again. How does that strike you?"

The foreman's eyes clouded. He was in straits, his savings exhausted, his rent overdue and no opening in prospect. Yet distrust died hard. "It strikes me," he declared roughly, "that you and old Newhall want something out of me pretty bad."

"I do," Crosby acknowledged promptly. "But Newhall would probably have a fit if he knew I was talking to you now. What you can tell me—what you can prove, doesn't matter the snap of your finger to him. This shop is on a sound basis now; any decent man can keep it there indefinitely. But I'm down and out"—his voice sagged—"unless you decide to help me."

For a full minute Williams debated. He was readjusting his attitude towards Fox, towards Newhall, towards this newcomer he had so cordially hated. The chance of a fresh start lured him.

"Sit down," he said; "what do you want?"

IV.

Crosby's buoyant air the next afternoon nettled the president. He had expected the supervisor to avoid his office, to ask an extension. Instead the latter's manner bespoke confidence, an easy mind.

"How are those reamers coming on?" he asked, choosing the topic he fancied would dash the other's spirits.

"The new design is in the pattern shop," Crosby answered. "We've machined down three of Fox's imperfect tools and are using them till the others come through. They figure in your statement"—he produced the tabulation which had initiated the dispute—"as costing eleven dollars. With your overhead, correcting them cost four-fifty each."

"What was the matter with them?"

"They were from sixteen to twenty-one thousandths of an inch off scale. Three one-thousandths is the limit.

"Here's a suggestion of what Fox's tools have cost you," he declared. "I had one section of our finished stock overhauled this morning. Of one hundred and twelve items inspected, more than forty per cent. of each must go into second-hand stock. Here's one bunch where three in every four must be thrown out even though we stretch our limit to five-thousandths."

The president waved the sheet aside

"I knew Fox's tools weren't perfect," he said shortly. "That's why we hired you. But you're dodging the real issue. Let's settle that: then we'll talk about the efficiency of Fox's tools."

Crosby's eyes gleamed.

"I spoke of efficiency first," he said, "because inefficiency is cost multiplied as often as you use the poor tool. If you insist that I ought to make a perfect reamer for what Fox turned out a worthless one, I tell you that you never knew what Fox's tools cost. He might have put them down as costing five dollars or twenty-five: you'd never know the difference."

Touched in his pride, the president swung round sharply. Crosby was framing up an excuse, he decided.

"That's a large statement," he said crisply. "Prove it—here—now."

The supervisor rose.

"There's a man outside," he began.

"Bring him in," Newhall ordered curtly. As Williams entered, however, he rose.

"That'll do" he said coldly. "I gave you a table of figures to explain, Crosby. You'll answer with figures, or not at all I'll not listen to a discharged employe."

The supervisor met him squarely.

"You gave me a table of gusses," he countered. "I'll meet them with facts if you'll let Williams talk. I've found where your profits are going. I'd like to tell you—after you've accepted my resignation."

Newhall studied him gravely.

"I accept it," he announced, "go ahead."

Turning to Williams, the supervisor put question after question, the answers indicating intimate knowledge of Fox's methods of time and cost keeping.

"What did the time cards show?"

The foreman shifted uncomfortably.

"Well," he said, "they showed the man's name and number, the order number, the time and the date. Sometimes"—he hesitated—"the order number was left off."

"You mean they didn't always state the job on which the time was spent."

Williams nodded.

"Those were Fox's orders," he defended. "He told us the front office was nutty about three or four accounts and that the easiest way to get along was to make a fine showing there and cover up somewhere else."

Abruptly the president intervened.

"What accounts were those?" he asked.

"D was one,"," the foreman faltered, mopping his flushed face, "F and G were were the ones Fox doctored most."

"How did he cover up, as you say?" Newhall's voice was level, but Crosby sensed the pain and wrath behind.

"Charged the time to general shop expense or transferred it to jobs that borrowed men had worked on. He said the office soaked us sixty-five per cent for overhead and that we might as well even up."

"Did Fox juggle any other accounts but these three?" The president was relentless. He saw his factory system tumbling; but like an honest surgeon he proposed to cut out the cancer, root and branch.

Williams grinned sheepishly.

"Whenever we spoiled castings or ran up the time on regular orders," he replied.

The president's eyes traveled back to Crosby's statement of imperfect parts now in finished stock. For a little space he was silent; then he turned to the supervisor.

"You make your point," he declared. "I wish you'd recall your resignation."

"Certainly." Crosby's face was aglow. Better than the vindication was the discovery that his chief was big enough to admit an error so flagrant.

"I didn't bring Williams here just to square myself," he continued. "I wanted to prove to you that your system of approximation is dangerous. You've seen how your departments can make products at a loss without you knowing it—how costs can wear masks and losses masquerade as profits. Come down into the shops and I'll show you where thousands of dollars of your legitimate profits disappeared: where inefficient tools and machines even now are cutting your margin down hundreds of dollars each month."

"You've got to quit guessing, Mr. Newhall,"—his voice rang with earnestness—"You sell everything you make for a fixed price, but you don't know what job makes or loses money. Knowing exact costs, you could cut out the unprofitable orders, reduce your selling price on others. You need accurate costs to help you sell. Without them, I can't get returns from my men. Now, then, do we get them?"

In his eagerness, he had risen. The president smiled up at him.

"We do," he declared, "line up your work so you can give me all your time for a month. I think"—his manner was judicial—" that I've tried to run this factory long enough without a superintendent."

ANNUAL MEETING OF AMERICAN SOCIETY OF MECHANICAL ENGINEERS.

The thirtieth annual meeting of the society will be held in the Engineering Societies Building, 29 West 39th St., New York, December 7 to 10.

The entire social entertainment will be in charge of the members resident in and about New York, under the immediate direction of a local committee appointed by them, of which Mr. William D. Hoxie, is chairman. For Wednesday afternoon, December 8, an excursion is planned which members and guests will be asked to attend in a body, and during the balance of the time there will be opportunities for smaller parties to visit places of interest. In the evening, there will be a lecture for members and guests upon the subject of Agricultural Machinery.

The professional papers assigned to the meeting are as fallows : Tests on a Venturi Meter for Boiler Feed, Chas. M. Allen ; The Pitot Tube as a Steam Meter, Geo. F. Gebhardt ; Efficiency Tests of Steam Nozzles, F. H. Sibley and T. S. Kemble ; An Electric Gas Meter, C. C. Thomas ; Tan Bark as a Boiler Fuel, David M. Myers ; Cooling Towers for Steam and Gas Power Plants, J. R. Bibbins ; Some Studies in Rolling Mill Engines, W. P. Caine ; An Experience with Leaky Vertical Fire Tube Boilers and the Best Form of Longitudinal Joint for Boilers, F. W. Dean ; Testing Suction Gas Producers with a Koerting Ejector, C. M. Garland and A. P. Kratz; Bituminous Gas Producer, J. R. Bibbins ; The Bucyrus Locomotive Pile Driver, Walter Ferris ; Lineshaft Efficiency, Mechanical and Economic, Henry Hess ; Pump Valves and Valve Areas and a Report on Cast-Iron Test Bars, A. F. Nagle.

In addition to the above papers there will be several valuable reports submitted by committees of the Gas Power Section.

PERSONAL NOTES.

F. P. Jones, general manager of the Dominion Iron & Steel Co., Ltd., has resigned to become general manager of the Canada Cement Co.

L. A. Crandall, manager of sales in the middle west, for the J. W. Paxson Co., Philadelphia, died at his home in Toledo, Ohio, October 17. Mr. Crandall had been connected with foundry supply houses for 25 years, and was one of the best known salesmen in that trade in the United States and Canada. For a number of years his headquarters were at Detroit.

The officers and shareholders at Aikenhead Hardware, Ltd., Toronto, recently waited upon their president, Thomas Edward Aikenhead, and his wife at their home in Markham Street, the occasion being their silver wedding, and presented them with a handsome silver tea service. The address and presentation were made by S. T. Shepard, the secretary of the company. Mr. and Mrs. Aikenhead were taken completely by surprise. Mr. Aikenhead expressed in fitting terms his appreciation of the gift.

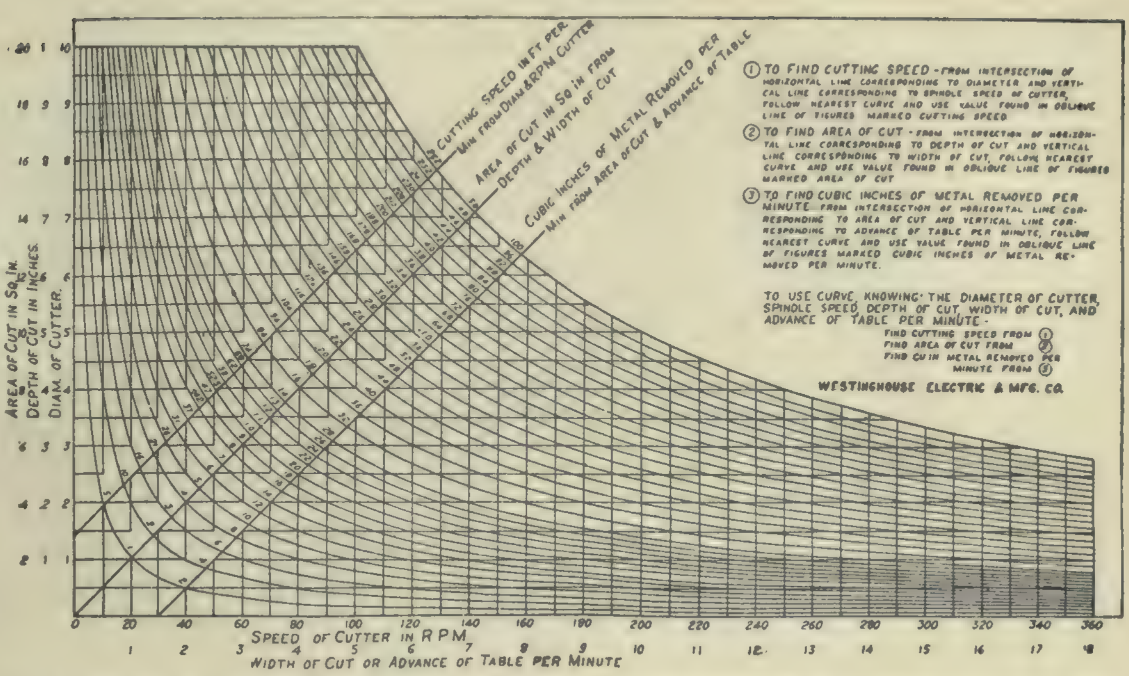
AN ALUMINUM FLUX.

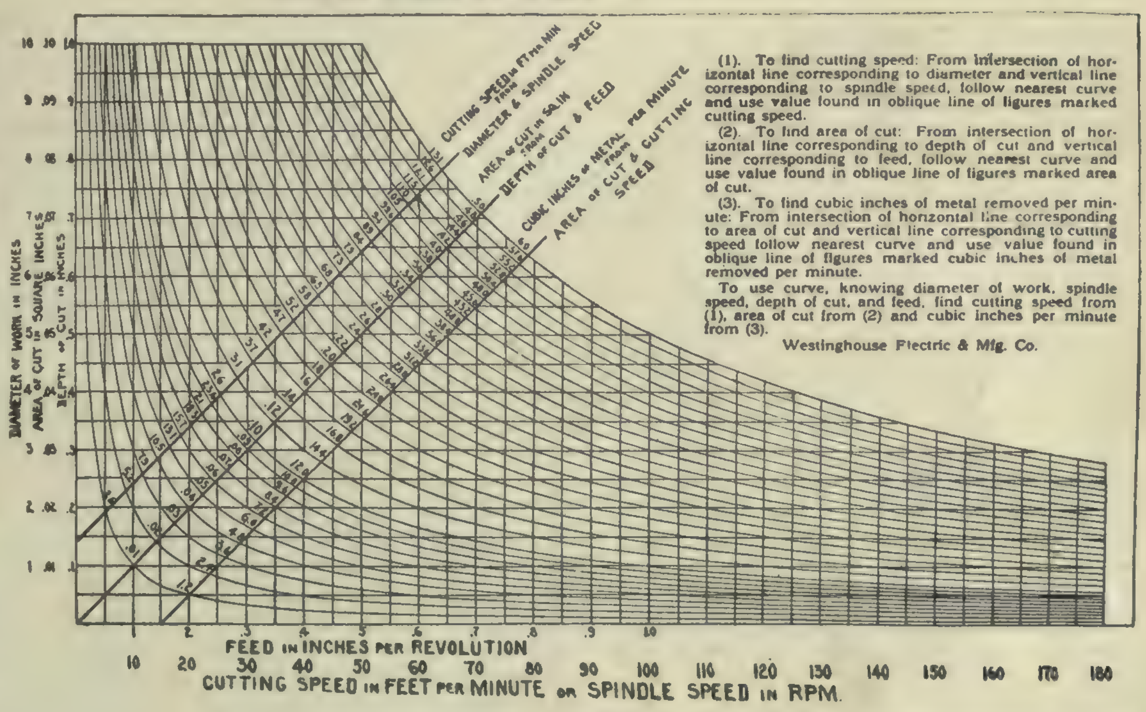
Chloride of zinc is now extensively used as a flux in melting aluminum. It is thrown on the surafce of the melted metal in the crucible, before pouring. The quantity to be used depends upon the amount of dross on the surface of the metal, which should be vigorously stirred throughout the reaction. If the surface of the metal has not been cleaned by the first lump of chloride of zinc, another small piece should be used.

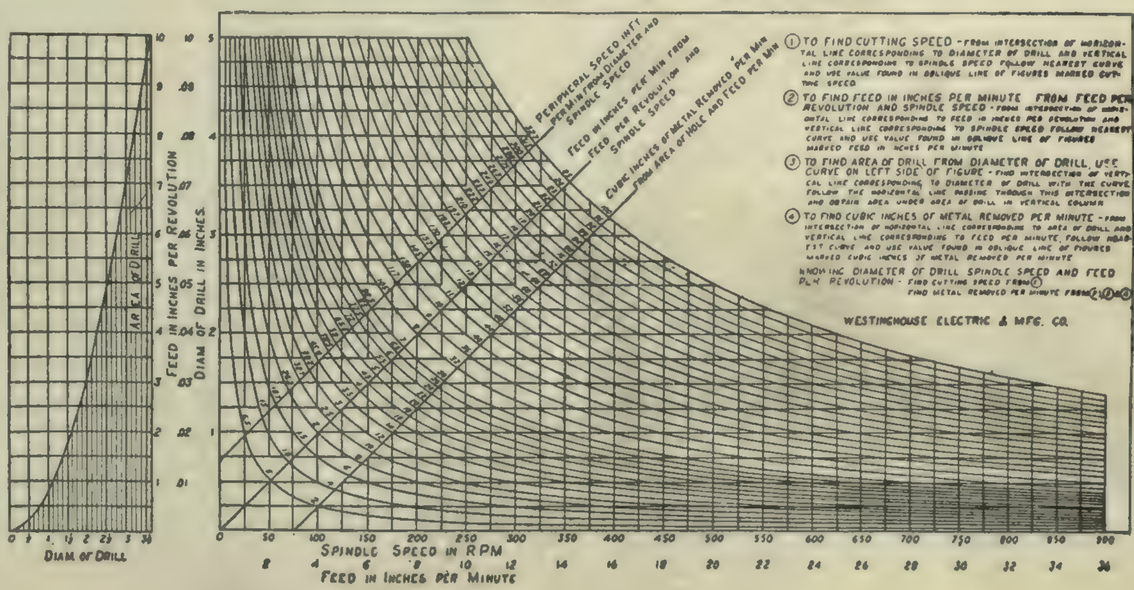
A good dip for pickling brass castings that are to be tinned, consists of oil of vitriol 1 gallon, aqua-fortis 1 gallon and common salt, 1 ounce.

CHATS FOR MACHINE-TOOL OPERATORS.

In connection with a paper on the "Application of Electricity to Railroad Shops," read before the Association of Car Lighting Engineers by J. H. Klink, the author, discussing the matter of power requirements, distributed three charts, reproduced herewith, which serve as a ready means for determining data relative to cuts by machine tools, where, with certain factors known, it is desired to find the remaining one. The explanation given on the charts will serve to indicate their use. There is no curve giving the horse-power consumed at various cuts, as this would depend on several conditions, such as condition of the tool, etc. Where automatic tool grinders are used, the tools will generally be found in such condition that the minimum power is required. From the curves showing cubic inches of metal removed for given sizes of cuts, the horse-power may be obtained approximately by the use of certain constants. For cast iron this constant would be from 0.3 to 0.5—for example, where the constant is 0.35, 10 cub. in. of metal removed per minute would mean 3.5 h.p. For brass the constant is from 0.2 to 0.3, for wrought iron 0.6, for tyre steel from 1 to 1.25. This applies only to tools in a horizontal position, where the metal removed will fall away; vertical drills and milling machines where the metal stays in and clogs the cut more or less, may require as much as fifty per cent. more power.







The Prevention of Accidents in Manufacturing Plants *

In View of the Many Serious Accidents in Industrial Plants, the Methods Here Given for their Prevention Should Prove Very Valuable.

Machinery should never be cleaned while in motion if it can possibly be avoided. The soft materials used in cleaning, such as waste and the like,

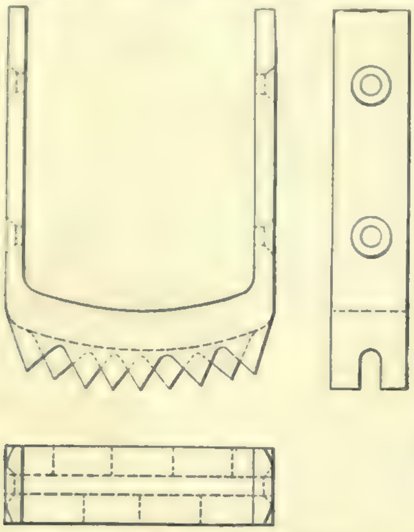


Fig. 1.—Ladder Foot Safety-Device.

catch easily in the gears, or other moving parts, and the workman's fingers, hands, or arms, are drawn in and broken and crushed.

All shafting and pulleys less than 7 ft. above the floor should be securely fenced. Housings of sheet-metal, iron grille-work, wire netting, or wood, or railings of pipe or wood may be used for this purpose. If it is impractical to fence certain pulleys, their arms should be covered with a disk of sheet metal or wood fastened thereto, with screws or wire. The use of inverted U or V-shaped metal-sheet shields, extending for a length of 15 ins. on each side of shaft bearings requiring attention when

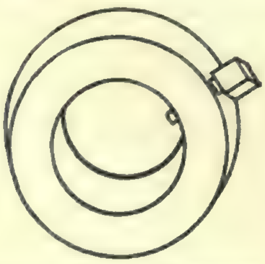


Fig. 2.—Projecting Set-Screw.

the shafting is in motion, is recommended. Even perfectly smooth shafting is highly dangerous when in motion, and no one should be ever allowed to come into contact with it when it is in motion.

Painting Moving Part of Machinery Red.

All moving parts of machinery and other moving parts wherever practical should be painted bright red. Although this method of warning has thus far been confined almost entirely to high-tension electrical apparatus, it has been extensively applied to machinery in general in European countries, and has proved a most efficient aid in the prevention of accidents.

Oiling Shafting.

The oiling of shafting should be done whenever possible while the machinery is at rest. Better still, the bearings may be fitted with automatic lubricators which need be refilled only when the shafting is not in motion. But sometimes the shafting requires attention while in motion, and safe means of access should be provided for this purpose. The following means are the safest. (1) A service platform suspended by metal straps from the ceiling, or carried on brackets, attached to a wall or to columns. Such a platform should be provided with a hand-rail three feet high and a skirting-board about six inches in depth, the latter to stop the foot in case of slipping. (2) A ladder provided with hooks or hangers to fit over the shaft at the upper end, and with some material to prevent slipping at the lower end. (A ladder should never be permitted to lean against shafting in motion, if it is possible to avoid so doing). For wood or cement floors, iron straps pointed at the end and screwed to the sides of the ladder, so as to project some two inches below the bottom are considered best. Fig. 1 presents an elaboration of this device, which has been very successful. These "feet" are made of malleable iron and are fastened to the ladder with ordinary wood screws. The "foot" illustrated in the sketch is for a ladder 3 inches wide at the foot and has ten staggered teeth on the bottom at about ¾-inch centres.

Rubber is also used to some extent for this purpose, but is liable to slip on a wet or greasy floor.

In no case where a line of shafting is close to a wall should an attendant be allowed to fix a ladder against the wall, and thus place himself between the shafting and the wall. Working in a cramped place like this, close to a rapidly revolving shaft is dangerous. (3). The use of a car hung from a rail or L-beam along the shafting, the rail or beam being suspended from the ceiling. The oil cans used in oiling shafting and heavy machinery should have necks at least 9 inches long.

Whenever the shafting or machinery thus requires oiling or other attention when in motion, the work should be done preferably by one man, who should

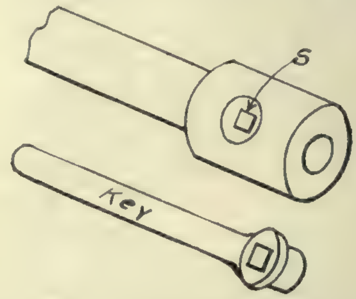


Fig. 3.—Countersunk Set-Screw.

be required to wear exceptionally tight fitting clothing, to lessen the chances of his being caught in the machinery.

Projecting Set Screws.

Projecting set screws when on line shafting and revolving parts of machines are a constant menace to life and limb. The ordinary clothes-catching-set-screw in a collar is shown in Fig. 2.

This hazard may be overcome at a trifling cost in any of the following ways. (1) By countersinking, as in Fig. 3. The set screw may be adjusted by a box-key shown therewith. Of course this method required either a shorter screw or a thicker collar.

(2). By using a flat-head set-screw slotted to take a screw-driver as in Fig. 4.

3). By the use of hollow-set screws. These are mare to take a hexagonal key or socket-wrench, as shown in Fig. 5. Either of the two latter obviate the

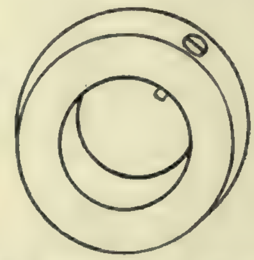


Fig. 4.—Slotted Head Set-Screw.

necessity of countersinking, and may be used instead of the old square-head screws. As it does not matter whether they come flush with the surface of the collar or pulley-hub or set below it, only one length of each size of screw is

required for any depth of hole. These screws may be protected against rust by filling the hole above the screw with wax. If the hole is quite deep and it is desired to lock the screws, one screw may be put down on top of the other.

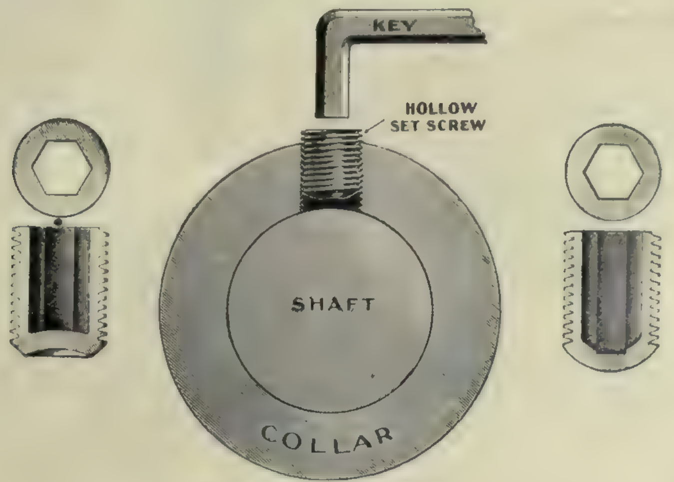


Fig. 5.—Hollow Set-Screws.

The hollow type is to be preferred to the slotted-head screw because there is not the danger of twisting the head off as in the case of the latter.

In a case where for any reason it is imperative that the old square-head set-screws be retained, it is strongly recommended that one of the following guards be applied. (1). A sheet metal plate curved to fit snugly over the screw and to spring on around the shaft. This serves both to keep the head from catching in clothing, and incidentally to retain the screw should it loosen. (2). A piece of leather belting laced about the screw. (3). Wooden guard rings. These are made in halves with a recess bored for the screw-head to fit in, and screw together thus forming a perfectly smooth ring which may be easily removed and replaced. (4). When set-screws or keys project at the end of a shaft they may be covered by a sheet-metal cap fitting over the shaft.

Shaft Couplings.

Fig. 6 shows the ordinary flange shaft-coupling with its array of clothes-catching bolt-heads and screws. These are a menace equally with projecting set-screws. Figs. 7 and 8 illustrate two forms of safety coupling. In the former there is used the thickened flange coupling and recessed bolt-heads and nuts, and in the latter the rim-flange coupling beyond which the bolt heads and nuts do not project. In either case it is next to impossible for them to catch the clothing. The safety feature should never be lost sight of when purchasing a coupling.

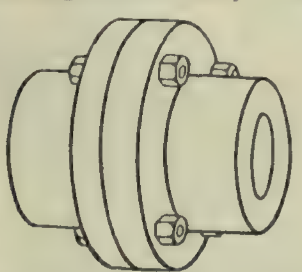


Fig. 6.—Projecting Bolt Coupling.

Guarding Belts.

Main belts which run through the floor should be boxed or fenced in to a distance of 6 ft. above the floor. Small belts, if running close to or through the floor, should be guarded sufficiently to prevent contact with a workman's clothing. If a man gets caught, cut a belt, if this is quicker than stopping the machinery. Where belt connections are made with motors or exhausters, the belts usually run at a very high speed, and it is well to fence off the whole apparatus. Pulleys should not be nearer a shaft-hanger or other obstruction than the width of the belt. This precaution will prevent the belt becoming wedged if it slips off the pulley, with the attendant danger of pulling the shaft down onto a workman. Spaces are allowed so that if the belts slip off, they cannot wedge and pull the countershaft down onto a workman. If sufficient space is not allowed for the belts, should they slip off, they will endanger a workman as the countershaft may be pulled down into him.

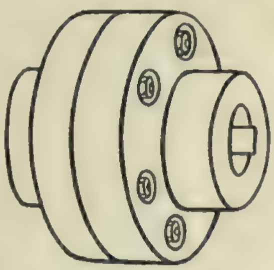


Fig. 7.—Thickened Flange Safety Coupling.

A belt should not be allowed to rest on a moving shaft. Something may catch and cause it to be wound around the shaft. In every place where it is desired at times to unship a belt, a belt-perch or hook on which to rest the belt should be provided, so as to prevent the belt from coming into contact with the revolving shaft. In case where a pulley is situated very near a journal, a guide bar should be placed close to the pulley, on the side opposite to a belt-perch or hook, at the point where the belt runs onto the pulley. This will prevent the belt falling between the bearing and the pulley and causing damage.

Belt Lacings.

The tearing and flying off of high speed belts is largely due to improper lacing. The lacing should be smooth and flat in order that the shock caused in passing over the pulleys should be the least possible. It will be readily recognized that if an excessive shock is caused in passing over the pulleys, the parts of the belt adjacent to the lacing will be subjected to heavy stresses, which will in time tear the belt. When this occurs the belt is liable to fly off and cause series injury to anyone standing by.

Belt lacings should be tucked well and the excess length cut off close to the belt so that it cannot catch in anything. Should a lacing catch, it may result in the unshipping of the belt. Belt cords on automatic machinery running at high speeds should be sufficeiently guarded to prevent flying in case the cord breaks.

Belt Shifters.

Often a belt is too large to be handled by a belt pole, and it becomes necessary for a workman to use a ladder in replacing it. In this case the ladder should be placed on the side of the pulley opposite the belt, as this position facilitates the operation, and lessons the danger of the workman becoming caught and drawn over the shaft. This is a dangerous operation at best, and should be avoided wherever possible, especially on high-speed shafts.

Loose pulleys and belt shifters or clutches should be used wherever possible for throwing machines out of motion when not in use. No employe should be allowed to shift a belt with his hands or a stick whilst the ma-

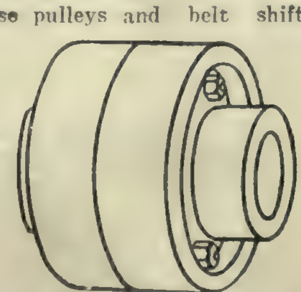


Fig. 8.—Rim Flange Safety Coupling.

chinery is in motion. The practice of shifting belts by hands is dangerous, even though they travel comparatively slowly. In cases where belt shifters are not provided, or where it is necessary to shift or repair belts on single pulleys while the machinery is in motion, these operations should be performed by one man detailed for all such work, who should be provided with suitable appliances for the purpose.

Care should be taken to make the belt shifter action used for removing a belt to the loose pulley, of a positive character either by employing one of the many forms of locking gear or a balance-weight. Many accidents have arisen through the lack of this precaution, the belt creeping back onto the tight pulley, and the machine just starting unexpectedly. This applies particularly to wood-working and other

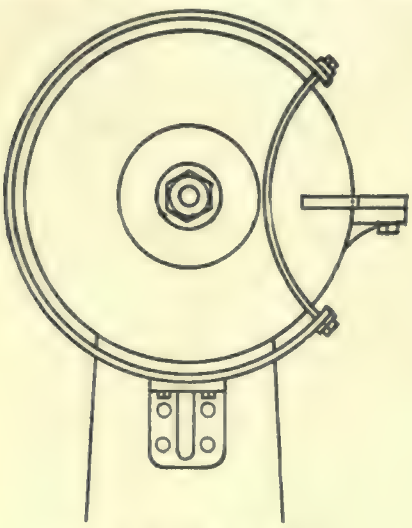


Fig. 9. Emery Wheel Guard.

high speed machinery. Machinery of this class is also set in motion without warning, sometimes, by the loose pulley seizing upon the shaft or by the side friction of the adjacent rims of the pulleys. This danger may be avoided by the mounting of the loose pulley on a well lubricated idle stud, co-axial with the machine-spindle, and using a collar which prevents any end motion in the direction of the tight pulley. The same object may be attained with existing troublesome loose pulleys by encasing the necessary bearing length of the shaft in a collared sleeve which does not revolve with it and on which the loose pulley runs.

Guarding of Gearing.

All gearing, sprockets, and chains with which a workman may come in contact, should be completely covered, so as to leave no point of danger between the guard and the gearing. Small and moderate-sized gears may usually be well guarded by a strip of sheet-metal screwed on to some adjacent stationary part and bent to conform to the contour of the gears. Very large gears may often be fenced to advantage. A train of small gears is best guarded by a wooden or metal casing, so con-

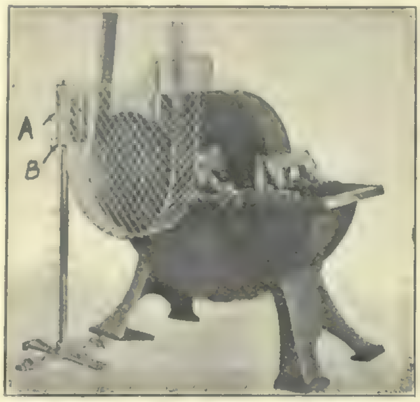


Fig 10. Grindstone Belt Fixed Guard—Closed

structed that it may easily be removed for repairs or oiling.

Pulleys.

Frequent inspections of the numerous small pulleys in use in every plant should be made. The arms of cast iron pulleys are very liable to crack. When this occurs a piece of the rim may be thrown out by centrifugal force and may cause serious if not fatal injury to any workman near by. The wheels should be hammer-tested frequently, to detect cracks.

Cranes, Winches, Etc.

These should be carefully inspected at intervals for such dangerous defects as worn chains, ropes, sheaves, or pins, broken split-pins, etc. All platforms should be provided with skirting boards to prevent the accidental rolling-off of spanners or necessary tools in use. All winches should be provided with efficient brakes. The crank-handle of a hand-

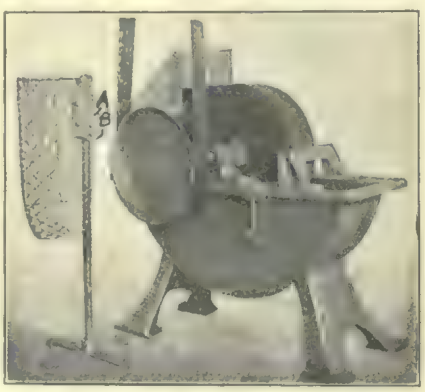


Fig. 11. Grindstone Belt Fixed Guard—Open.

switch should not be permitted to attain a very high velocity in running down. Fatilities have occurred from the handle flying off, due to centrifugal force.

All overhead cranes should be provided with a railed walk the entire length of the bridge. It seems strange that manufacturers would build cranes without these walks, but they do. These cranes should also be equipped with foot-gongs, for the use of the operator, with a box on the bridge in which to keep tools and oilcans, and with limit-switches to prevent running the hoist blocks into the drums and probably breaking the cables, allowing the burden to fall onto workmen below.

Each crane should have a switch instaled at some point on the bridge which will cut off all power, making it impossible to start the crane from the cab. Many men have been injured while working on the top of a crane by a thoughtless craneman forgetting for the moment that they are there and starting the machinery.

Each man working on a crane should be provided with a warning sign bearing his name, which he should attach

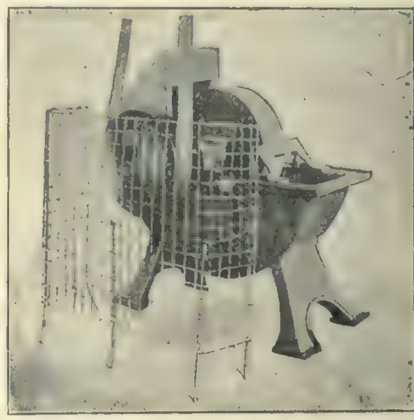


Fig. 12.—Grindstone Belt Movable Guard.

to the safety switch, warning all not to throw in that switch, as he is working on the machinery. All overhead cranes should be equipped with sweep-brushes, extending out from the truck wheels, sweeping the rails, the purpose being to warn a person resting his hand on the rail of the approach of the crane. The number of arms and hands lost by persons working on scaffolds along crane runaways, who thoughtlessly rest against the runaway and fail to notice the approach of the crane, is appalling. Four instances have come to my personal knowledge within the past year were these brushes have prevented such accidents. No man should ever be allowed to go on to an overhead crane runway without permission from his foreman, and then, not until the cranemen have been notified and steps taken to protect him from the cranes while he is on the runway.

Chains.

Hoisting and other chains under heavy stress from time to time grow weaker

continuously by reason of crystallizing of the metal. The action of crystallization will continue to a point where rupture will occur under a comparatively light load, unless checked by annealing the entire chain at least once every six months. The effects seem to be more marked in metal which undergoes the interchange of heat and cold very often, and to these especially should this treatment be applied. Chains should be carefully examined for any weakness, at regular intervals.

Position of Machinery.

Under no circumstances should machinery be crowded, so that those using the passages are placed in danger. Any passage towards which a planer-platen, lithographic printing-table, self-acting mule or other carriage runs, should have 18 ins. space in the clear, between the carriage or any fixed structure, when the carriage is fully out. Occasionally a shaft or belt running across or projecting to a stairway is met with. Such shaft or belt should invariably be boxed in, and a warning sign hung from a guard box if it encroaches on the headroom.

Guarding Fans and Blowers.

Revolving fans and intakes of blowers within reach of persons standing on the floor or on adjacent platforms should be guarded by wire screens of not greater than one-half inch mesh.

Emery Wheels and Grindstones.

Emery wheels and fast-running grindstones should be enclosed by a substantial guard, fastened to the wheel-base and of sufficient size and strength to withstand the shock of the flying parts of the bursting wheel. The fact should be recognized of course, that an emery wheel may be broken or caused to burst from improper use, as for instance excessive pressure or blows when grinding a tool as well as from excessive speed.

Fig. 9 shows what is considered to be the best guard of this kind. The wheel is entirely surrounded except for a small open space at the front of the wheel above the rest. This is ample space to work conveniently and yet the wheel is well protected, and the workman protected. Another good safety device is so designed that the wheel plays a part. The sides instead of being parallel, are divergent, so that the thickest part of the wheel is at the centre. A number of sets of steel safety collars are furnished, varying in size, so as to allow for wear of the wheel, which fit the wheel tightly to a distance of two inches from the grinding surface. In case the wheel ruptures the tapered sides cramp between the collars, and so do not allow the pieces to fly. A number of manufacturers of emery wheels loan safety collars free of charge to the users of the wheels. Advantage should always be taken of this offer.

The following suggestions as to the use of emery wheels should be carefully observed. Do not have the rest so far away from the wheel that the work may become cramped. The use of a releasing-rest may be the means of saving crushed fingers. This applies also to grindstones. Keep the boxes well oiled so that the arbor will not become heated, and by causing expansion rupture the wheel.

Never crowd an emery wheel upon an arbor. Have the wheel slip easily on the mandrel, and screw them only tight enough to prevent slipping. Wheels should be mounted so as to run true and steady.

Do not allow the wheel to vibrate when running at normal speed. If there is vibration, either true up the wheel or re-babbitt the boxes after trueing up the journals or both.

Never mount wheels without flanges. Do not use too small or too light flanges and have them properly concaved. They should be at least one-third the diameter of the wheel. The makers in general recommend one-half as still better practice, always concave, never straight or convex.

Never screw a nut directly against the emery wheel. It will "creep" and rupture the wheel from excessive side pressure at the bushing. Never run a wheel above its indicated speed.

A workman on an emery wheel should keep his eyes and body out of the plane of rotation of the wheel, chips from the wheel will be less likely to strike him if this suggestion is heeded. The grinder will find that large glasses made of plain glass, or indeed his own spectacles, should he wear them, will afford great protection from flying particles; or he may use other protectors with glass in front and gauze surrounding the glass.

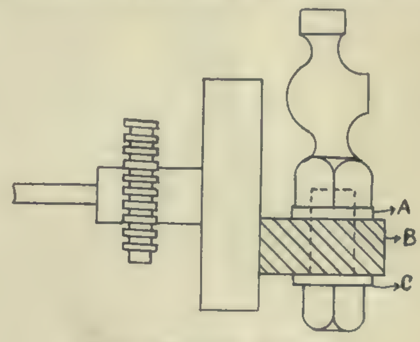
Great care should be taken in storing emery wheels and grindstones to keep them free from dampness. They should not be stored with the stone standing upon the ground, as it will absorb moisture. Likewise the idle mounted stone used in wet grinding should not be left over night, or for any long period, with a portion immersed in water. Particular care should be paid to the guarding of grindstone belts and pulleys. Although these usually run at comparatively low speed they offer much opportunity for injury to a man stooping to pick up a tool he has dropped (quite a common occurrence) in the process of grinding. Figs. 10 and 11 show an excellent form of guard of stout wire for this purpose. The guard is fixed to the collar A which moves freely about the pipe standard. The lower face of this collar is furnished with a V-shaped projection which engages with either of the V-shaped slots in the upper face of the collar B, according as the guard is open or shut. The collar B. is firmly fixed to the standard with a set-screw.

The objection to a movable guard for this purpose of the type shown in Fig. 12 is that a man may have to remove the guard, and will thereby run the risk of being hurt by the unfenced belt or pulley when he stoops to pick up a fallen tool. Another objection to a guard of this kind is that a careless workman may remove it and fail to replace it.

HANDY TOOL FOR CHUCKING.

By J. B. Kennedy.

The accompanying illustration shows a very handy tool for chucking work, especially in brass shops. There is practically no trueing up after the first one is machined. Most shops have an old 4-jaw chuck plate (although a special plate for the purpose is better), for which 2 new jaws and screws may easily be made on the premises. In the sketch the lug B is shown off the centre, which



Handy Tool for Chucking.

allows for work with extra long centres. The other jaw has the lug in the centre for ordinary work. The jaw not in use can be adjusted to balance the chuck when running.

The sketch shows the manner of holding the work, by the mandrel or screwed chuck C, coming up through the lug of jaw. A is a washer. The work is then placed over it and screwed down. Flanged work which would require an L-plate can be held fast, between the jaws and trued much easier and more quickly than could be done on an L-plate.

Misfortune always keeps her appointments with those who expect her.

The minute a man begins to consider himself indispensable he ceases to be.

MACHINE SHOP METHODS AND DEVICES

Unique Ways of Doing Things in the Machine Shop. Readers' Opinions Concerning Shop Practice. Data for Machinists. Contributions paid for.

PLANER FIXTURES.

By J. H. R., Hamilton.

Fig. 1 shows a very useful vise for use on a planer for a variety of work. The piece P having a tongue planed on the bottom to fit the tee slots of the table, is bolted to the table and planed on the faces. The piece P_1 is similar to piece P only flat on the bottom, to pass freely over the table. The work is placed between the two pieces (light pieces being placed on the small shoulder as shown) and securely fastened by means of the stops S S, the clamps C being used to keep the piece P_1 flat on the table. The screw e passes through the stop S making an angle with the table of about 10 deg.

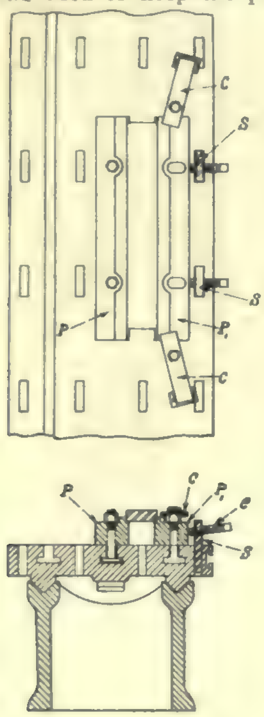


Fig. 1.

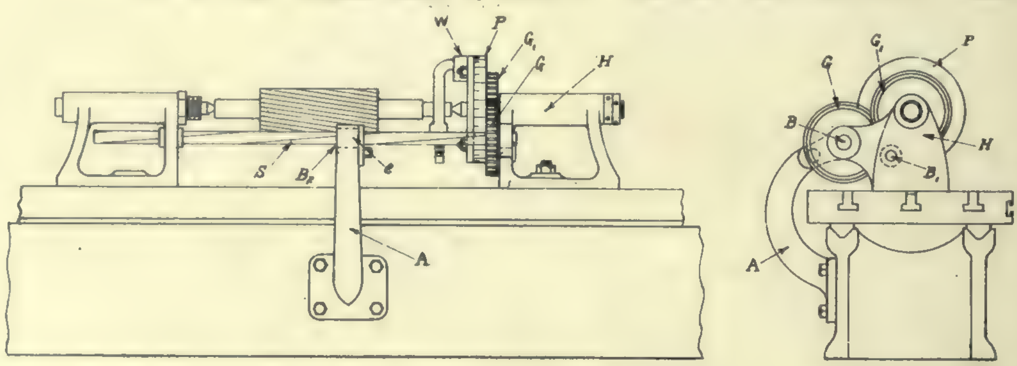


Fig. 2.

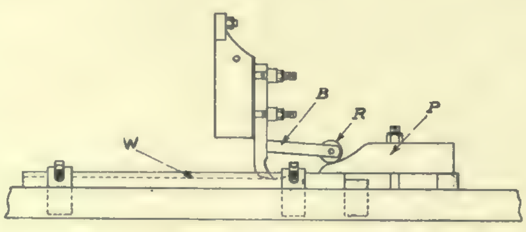


Fig. 3.

Some Planer Fixtures.

Fig. 2 is a sketch of an attachment placed on a planer for cutting spiral grooves or flutes in cutters, corrugating rolls, etc. The centre heads are similar to the ordinary ones used, with a few additions. As shown, one head has two special bearings, B and B_1. B is to carry one end of the shaft S and a similar bearing in the other centre head carries the other end of the shaft.

Fastened to one end of shaft S is a gear G which meshes with another gear G_1, secured to the centre shaft of head H.. Secured to gear G_1 and likewise to the centre shaft is the face plate P which is graduated on the edge.

A wing plate W is free to revolve on the hub of the face plat P and secured in position by the two bolts shown by means of a tee slot in plate P. The wing plate W has a slotted fork on its face which drives the dog that is fastened to the work. A set screw in one side of the fork avoids any back lash to the tail of the dog.

The arm A is secured on the bed of the planer in a suitable position, the bearing B_2 being in line with the bearing B and the bearing in the other centre head.

The small bush e is fitted in the bearing B_2 and grooved out on the inside to fit the twisted shaft S, which is twisted to suit the work to be done.

The bush e being stationary, as the table moves, the shaft S is caused to revolve and likewise gear G which turns gear G_1, which revolves the work as the tool is cutting the groove. By loosening the two bolts in the wing plate W the work can be revolved to the next position.

By using a pair of smaller gears and an intermediate one in bearing B_1, the work will be turned in the opposite direction. By the use of change gears several different spirals can be obtained from the one shaft S.

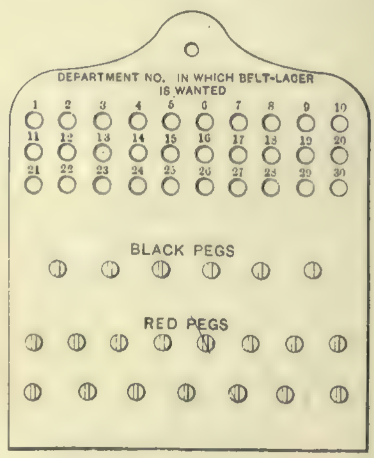
Fig. 3 shows an arrangement used when cutting key-ways or slots, when it is advisable to run out instead of cutting into a drilled hole or slot. The bar B is fastened along with the tool in the desired position, the outer end carring the roller R which comes in contact with inclined face of piece P, which gradually removes the tool from the work.

KEEPING TRACK OF BELT LACER.

By K. Campbell.

The accompanying drawing shows a recording board, used in our shops in West Toronto, which gives the number of the department in which the belt lacer is at work and also indicates where he is wanted. Before this simple device was used, there was a lot of waste time looking for the man who looked after the lacing of belts.

The board has thirty holes at the top, each having a number corresponding to a department. At the bottom of the board are additional holes, containing six black pegs and fifteen red pegs. These latter are numbered from 1 to 15.



Recording Board.

When belt lacer is wanted one of the numbered red pegs is put in the hole at the top to show the department where a belt requires attention.

When the belt lacer returns he sees at a glance where he is wanted. Before leaving he replaces the red peg with a black one. The first one uses red peg 1, the second one requiring his services uses 2, etc., so that the belt lacer can tell where to go first. By using the black peg the belt lacer can be easily reached in an emergency.

TURNING CRANK SHAFT.

By Nemo.

Having a three-throw crank shaft to turn up, it being a forging, all in one piece, the pins and bearings to finish to 10'' diameter, and not having a lathe heavy enough to swing and balance it while turning the pins; the question of balancing seemed to be a formidable one.

The face plate of the lathe was far too small to think of bolting any weights to it, which would overcome the w'ight of the shaft whilst turning pins, and it was equally impossible to clamp anything like a proportionate weight on opposite side of shaft.

The best plan I could think of at the time, was as follows:—I got two pieces of 1'' x 4'' steel bent U-shaped with holes in each end to take the cable ends; then I drilled holes in the bottom of the U, and made a bearing of babbitt metal about ½'' thick. I then carried wire cables from the ends of these pieces through sheaves attached to the beams above the lathe, and to the other ends of these cables, attached weights enough to maintain the shaft in any position. The weights agregated about three tons. This plan worked admirably, the lathe turning easily, the weights moving up and down freely as the shaft turned, and enabling us to turn the pins round and true, and at a minimum cost.

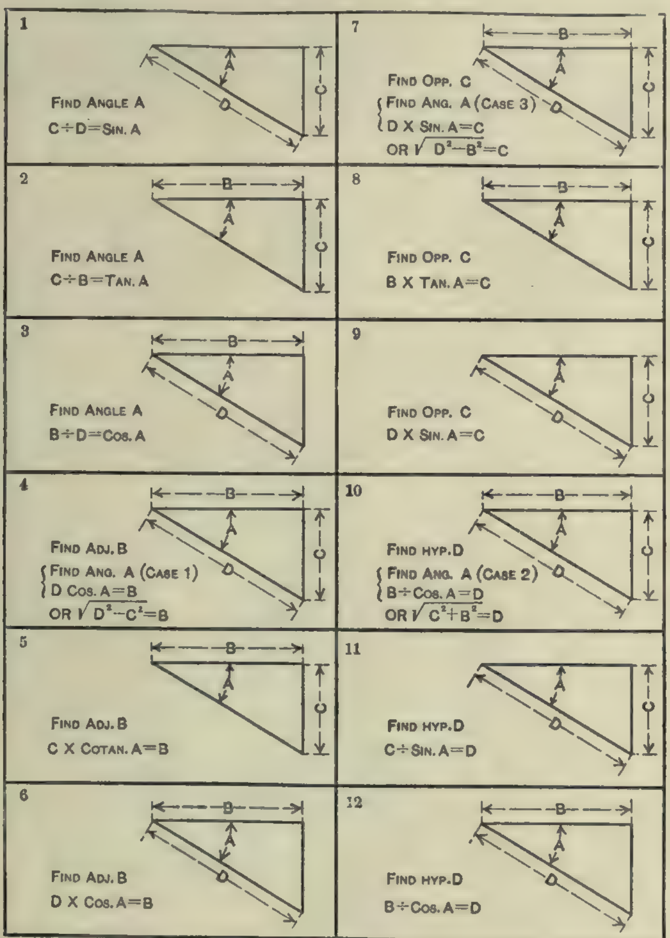
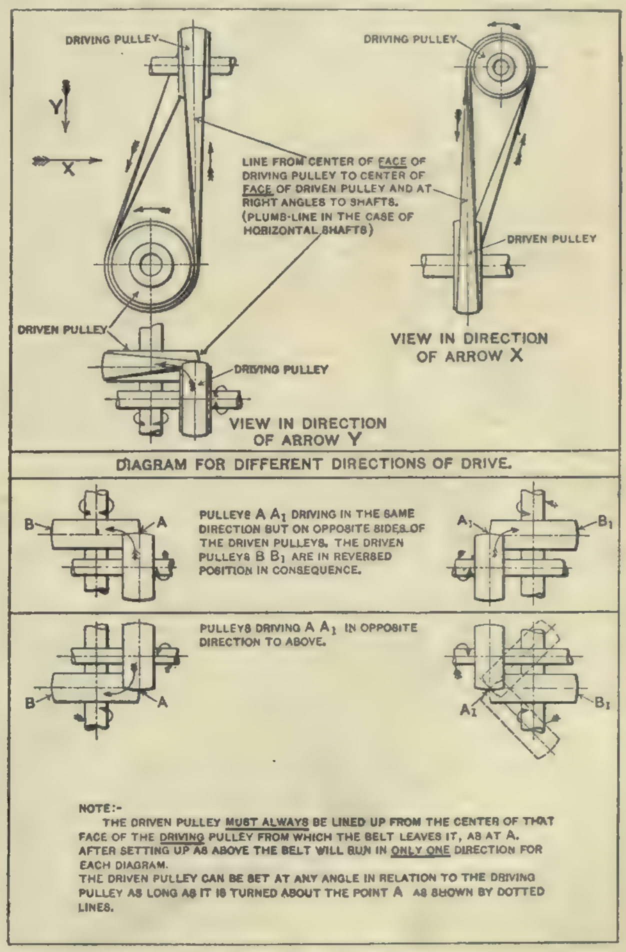


Table for Solution of Right Angles.



Locating Angle Belt Drive.

HANDY TABLE FOR THE SOLUTION OF RIGHT-ANGLE TRIANGLES.

By F. J. Bouve.

The table above gives in a convenient form the rules necessary for solving right-angle triangles. To the toolmaker or apprentice who has not had the privilege of becoming familiar with trigonometry, it is put up in a very handy form for reference. There are a great many who do not understand the meaning of "square" and "square root" and who will find it easier to first find the angle when two sides are given, and then find the required measurement of the third side from the angle by the rules as stated. It will be noted, however, that the formulas giving the length of the third side when two sides are given in the form of a square root is also included.—Machinery.

LOCATING ANGLE BELT DRIVES.

The accompanying illustration reproduced from Machinery is a date sheet of angular belt drives. The diagrams show all the different positions of the pulleys for different directions of rotation of the shafts, and are also applicable to shafts in any position, vertical or horizontal.

CORE DRILLING TOOLS.

By W. Petersen.

The illustrations herewith show some designs of tools for core drilling used on various jobs in railroad shop work. These tools have been in use for several years, and during that time have proved to be very effective. The principle is not new but the details of them were arranged with the view of getting a tool that was cheap to maintain, capable of standing up under heavy cuts

without springing, and to produce holes of an exact size.

Tool number 1 is used for rod work. The cutter head is made from a steel casting, and blades are of high speed steel. A tongue on the back of the blades fits into grooves on the head. The strain is thus taken off the binding screws. The cutters are ground with a side clearance in opposite directions to each other. This is very important as it unsures that the cuttings are broken up in the centre, leaving them only half the width of the groove. Failure to follow this principle will invariably cause trouble in deep holes as the cuttings will choke up the groove and break both the cutter and the head. A tempered steel bush has been fitted to end of pilot in order to maintain the size.

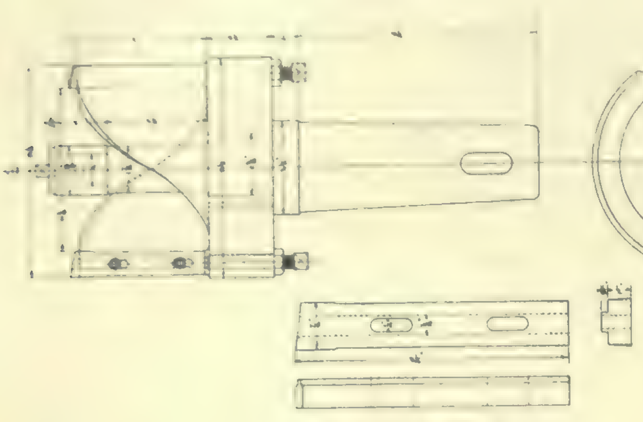


Fig. 1.—Core Drilling Tool.

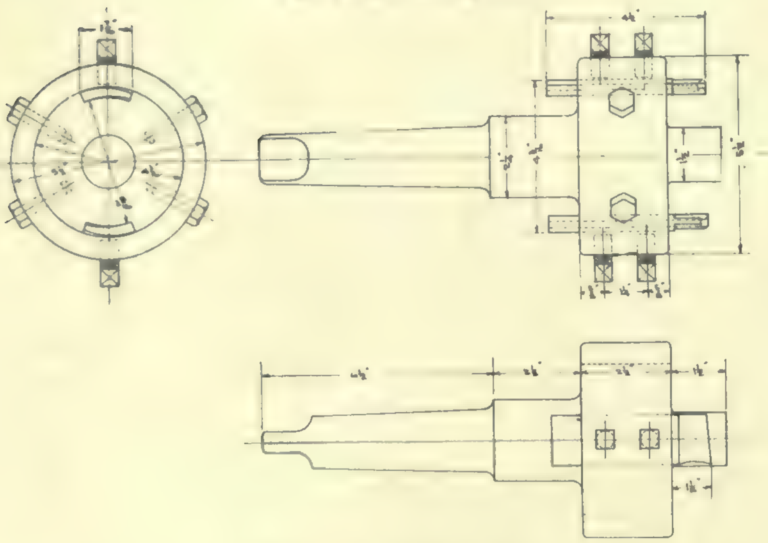


Fig. 2.—Core Drilling Tool.

Tool number 2 was designed for plate work. The first consideration to be given was to produce a hole of exact size and perfectly round, as it had to be tapped. The body is made of machinery steel. The seats for tools carefully machined. A collar is then shrunk on, and high speed steel cutters fitted into the grooves. These cutters are only ground on the ends and can be removed for grinding, or can be replaced any number of times without in any way altering the sizes of holes.

Tool No. 3 is an adjustable tool for the same class of work as No. 2, and for holes of varying diameters. The sizes are quickly determined by inserting standard blocks of various sizes behind the cutters. This tool comes in very handy where there is comparatively few holes to drill of any one size, but for standard sizes, however, where a large number of holes are required, it has been the writer's experience that it pays to make non-adjustable tools, for the reason that no time is lost at the machines in setting and sizing these tools. They can also be made much more substantial and rigid, and thus allow a much heavier cut to be taken with them than would be possible were they adjustable.

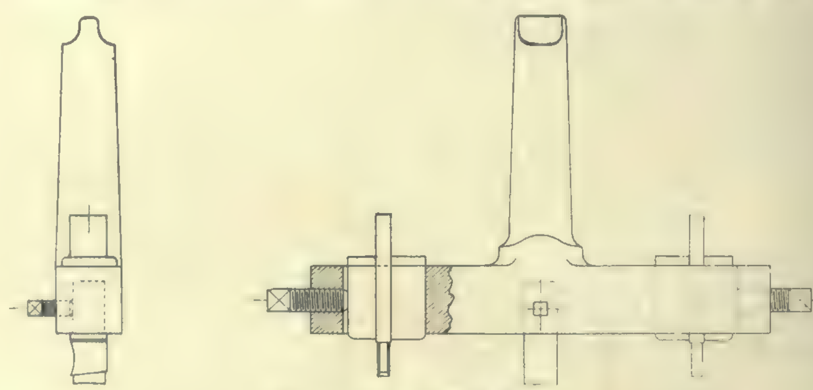


Fig. 3.—Core Drilling Tool.

BORING ELLIPTICAL HOLES.

A lathe atachment for boring elliptical holes has been patented by James Shaw, Dauphin, Man. Fig. 1 shows the lathe with attachment in place, A and B are movable supports. C is a boring bar with eccentric end bearings.

Fig. 2 is a longitudinal section through the bearing brackets showing boring bar C. The ends D and E are eccentric to C and are in alignment longitudinally the one with the other. D and E are carried by bearings which can be raised vertically in guideways at the rear face of the supports, while at the other face the main shaft has bearings with horizontal guideways. When the device is in operation the sliding bearings are free to move in their respective ways. In the main shaft is a hole for the cutting tool, shown in Fig. 2, and in Fig. 1, the tool is shown in position boring an elliptical hole in the work on the lathe carriage.

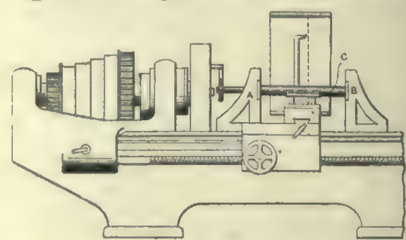


Fig. 1.—Lathe for Boring Elliptical Holes Showing Device in Place.

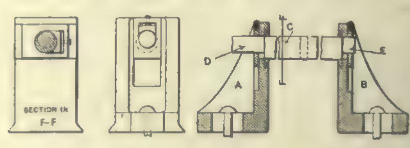


Fig. 2.—End and Sectional Views of Elliptical Boring Device.

MANUFACTURE OF SHAPERS.

The accompanying photos illustrate two of the most important shop operations in the manufacture of shapers in the shop of the Queen City Machine Tool Co., Cincinnati. They show how the bind and buckle is eliminated from the working parts and how friction is reduced.

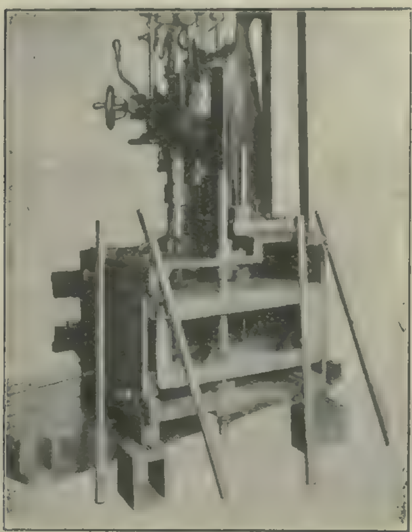


Fig. 1.—Box Pattern Jig.

Fig. 1 shows the boring of columns. Note that all holes are bored and cast iron bushed, providing for the maintenance of original centres, and this jig insures practically perfection of original centres, and interchangeability. It is of true box pattern, both ends of the large boring bars being supported, and provided with knuckle joints; the holes are roughed out so that only a light skim is removed with the special finishing cutter. This insures the proper distancing and alignment of shafts, and as all gears are turned to gauge and cut with special cutters, the result is as near to perfection as is possible. The connecting work between bull wheel and rocker arm is also carefully jigged, to make good results certain.

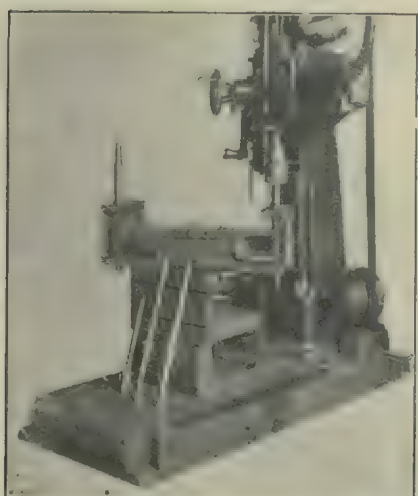


Fig. 2.—Boring Shaper Rocker Arm.

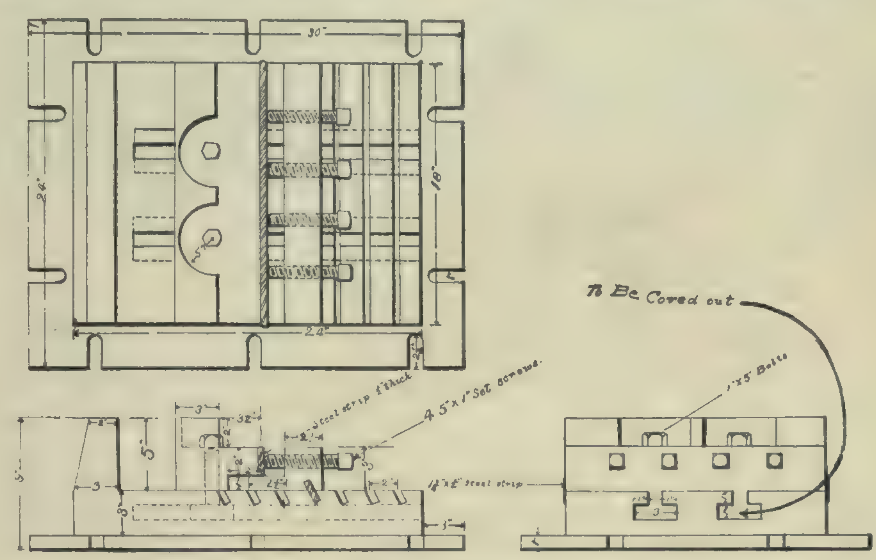
The top and bottom holes in the rocker arm must also be carefully bored at exact right angles to the planing of sliding block bearing, as the slightest twist here is fatal to good results. Fig. 2 shows the jig in working position. All shafts are accurately ground, insuring smooth running and long life.

PLANER CHUCK.

By W. B. Miller.

The accompanying illustration shows a planer chuck we have used on a London 36" x 36" x 14 feet planer for over a year. The chuck will stand more than the belts will pull for I take off some big chips with this machine.

It will be noted that the slots A are slanting about eight degrees, which is an advantage. Block B does not raise up and tighten the set screws for this trouble is overcome in the slanting slots. Another advantage is the wide base C to all the chuck to be fastened on to the platen. Lugs might be used to fasten chuck to platen if desired. The jaws are made heavy so that a light cut may be taken off when necessary to keep them true.



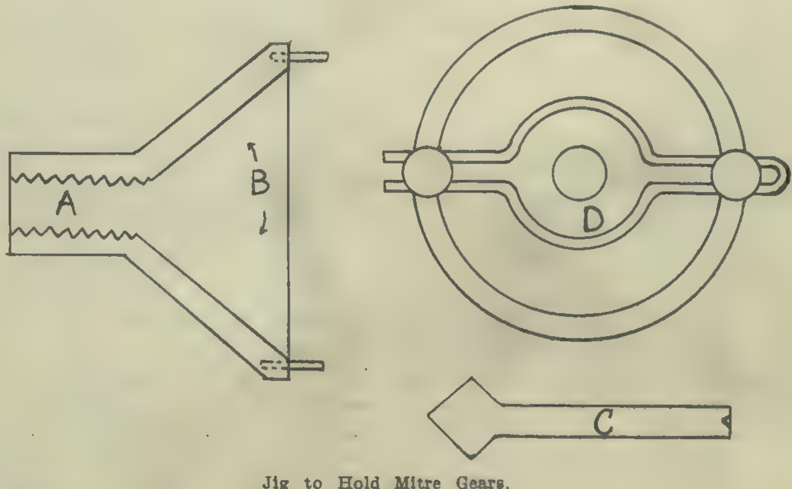
Planer Chuck.

JIG TO HOLD MITRE GEARS.

By F. A. Rodgers.

We use a jig to hold mitre gears when boring and facing them. I work in a shop in Victoria, B.C., where I have 200 steel mitre gears to bore and face. I devised the device shown in the sketch, and with it I turn out 25 in nine minutes.

The jig is made of cast iron. A is threaded to fit spindle of lathe, and B is bored on a bevel, which should correspond to that of the mitre gear, C is a spear, centred at one end, which holds the gear against the jig until it is "turned up." Then clamp D is used. It is fastened on the jig by two studs tapped in same. The job can be very quickly "trued up" by tapping with a hammer on high spots shown by chalking, each time following up with spear by use of tail stock centre.



Jig to Hold Mitre Gears.

DEVELOPMENTS IN MACHINERY

New Machinery for Machine Shop, Foundry, Pattern Shop, Planing Mill; New Engines, Boilers, Electrical Machinery, Transmission Devices.

KEARNEY & TRECKER UNIVERSAL MILLING ATTACHMENT

Five illustrations show the construction and application of the new universal milling attachment recently placed on the market in connection with their

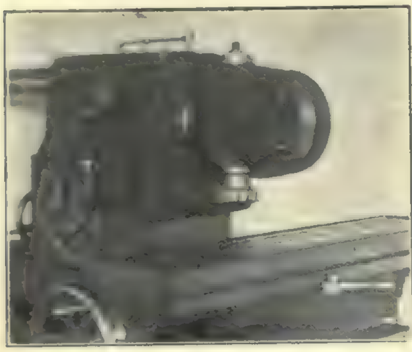


Fig. 1.—Attachment in Position for Vertical Milling.

milling machine, by Kearney & Trecker Co., Milwaukee, Wis. Fig. 1 shows the attachment in position for vertical milling. Fig. 2 shows the use of the attachment for horizontal milling, but in a position at a slight angle with the axis of the main spindle. Fig. 3 shows the attachment set for angular milling. In Fig. 4 the attachment is shown applied to the machine, with its spindle at right angles to the axis of the regular milling machine spindle, but parallel with the table. It is here shown operating in connection with the spiral head.

Fig. 5 shows a section of the device. It will be seen that the gear A is attached to the regular horizontal spindle of the milling machine, and drives gear B keyed to a horizontal driving shaft on the end of which is cut a bevel pinion

Fig. 2.—Attachment Used for Horizontal Milling but at a Slight Angle With Axis of Main Spindle.

C; this pinion drives the bevel gear D, which latter is made in one piece with the bevel gear D_1. This arrangement permits the pinion E to revolve to any position without interfering with the driving pinion C. The bevel pinion E is cut on a steel sleeve on which also are cut spur gear teeth of wide face meshing, with a similar gear provided on the cutter spindle of the attachment. All of the gears, as well as the cutter

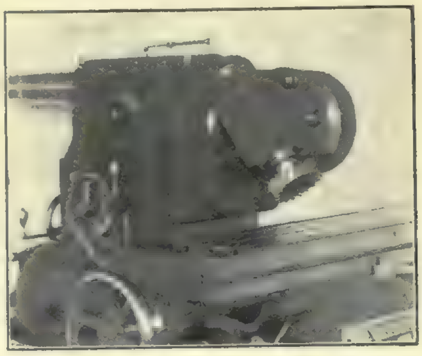


Fig. 3.—Attachment in Position for Angular Milling.

spindle, are made from hardened steel, the spindle being ground on the outside as well as in the tapered hole.

The wear on the bronze boxes is taken up by an adjustment nut or collar at F. The bushing G rotates with the spindle, it being keyed to the latter. Thus when the nut F is tightened, this bushing slides forward, and the spindle is at the same time drawn back into the taper box at the front bearing. The end of the spindle is provided with a slot or keyway for driving arbors carrying face mills and large milling cutters in general. The attachment is heavily built, and can be used for any work. It will fit all sizes of their milling machines.

This device in connection with the regular horizontal milling machine makes

Fig. 4.—Attachment Used in Connection With Spiral Head.

it possible to do all classes of milling on this type of machine, and due to the fact that the attachment has been built along heavy lines, it is possible to perform vertical and angular milling practically to the full capacity of the main spindle of the machine. It has a capacity for face milling with cutters up to 6 inches in diameter. The attachment is made in three different sizes, all being provided with No. 10 Brown & Sharpe taper hole in the spindle. The distance

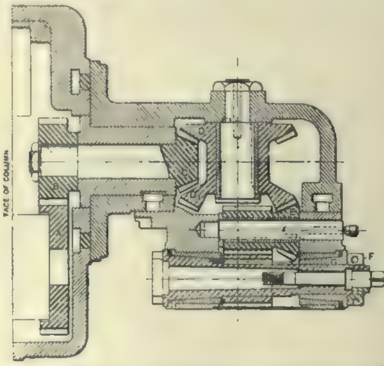


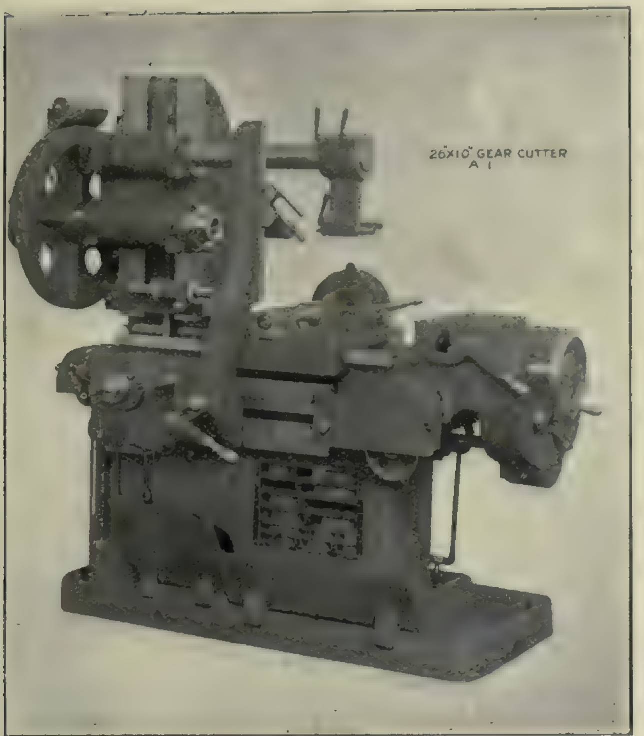
Fig. 5.—Section Through Universal Milling Machine Made by Kearney & Trecker Co.

from the centre of the spindle to the bottom of the attachment does not exceed 19-16 inch, and the distances from the centre of the spindle to the face of the column when used for vertical milling is 10⅞, 11¼ and 11½ inches, respectively, for the three different sizes.

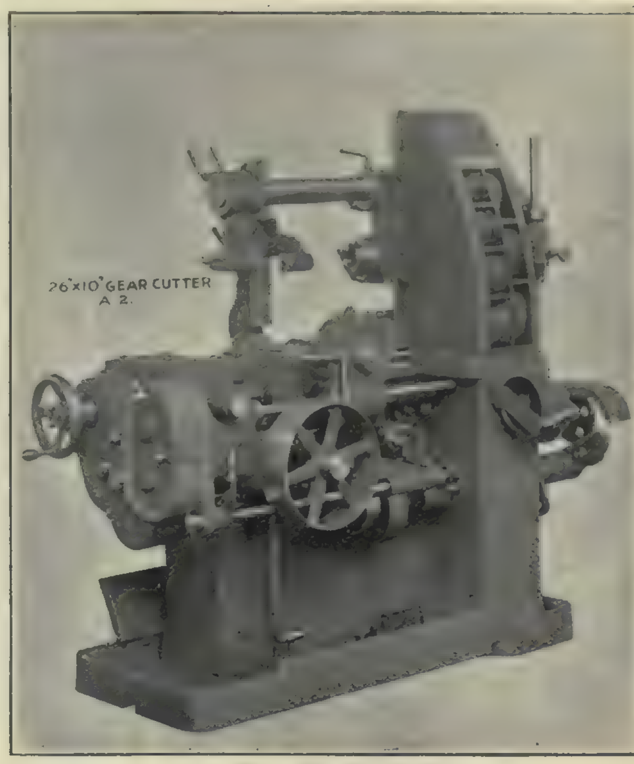
"CINCINNATI" AUTOMATIC GEAR CUTTING MACHINES.

These machines, to cut spur gears 26" x 10" and 36" x 10" respectively, have been designed with a view to securing rigidity, large wearing surfaces, and simplicity of parts. The power is transmitted through one pulley, running at a constant speed, and the various speeds and feeds are obtained by transposing gears, conveniently located. All gibs are of the taper type, adjustable from the ends. All shafts and spindles are accurately ground, and are journalled in bronze bushes. The movements are all automatic, each being dependent on the preceding one, and cannot take place until it has been completed. The work saddle is so gibbed to the housing that the work arbor and blank do not drop out of parallelism when the clamps are loosened for adjusting the work for tooth depth. The screw is operated from the front of machine, and has micrometer collar graduated to .001 of an inch. The work spindle, of steel, is accurately ground and journalled in bronze bushes, and has provision for taking up wear. The arbor is drawn in and forced out by a threaded shaft and hand wheel.

The cutter slide has rectangular guiding surfaces with long taper gibs, for



A 1.—26" x 10" Gear Cutter.



A 2.—26" x 10" Gear Cutter.

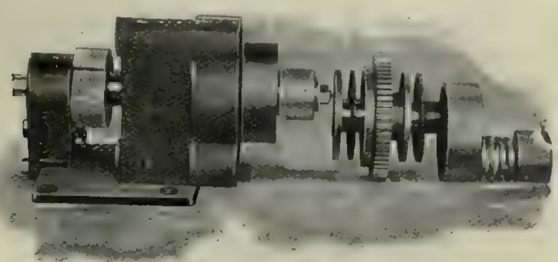
taking up wear, both vertically and horizontally. The length of the guiding

A 10.—Cutter, Bearing and Spindle Assembled and in Detail.

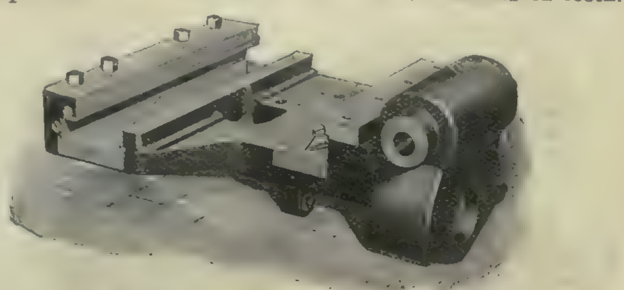
surface is over 4 4-7 times its width, thus reducing any binding action. The slide is fed forward and retracted by a screw. The dogs, for adjusting the justable dogs, is provided so that the slide can be run to the extreme back position for removing blanks without disturbing the setting of the dogs. An automatic disengaging crank wheel is provided to move the slide by hand. The cutter slide returns at a constant speed, regardless of rate of feed. There are 12 changes of feed.

The cutter spindle, of large diameter, is accurately ground and has easily accessible means for taking up wear. The spindle has both a taper and a straight bearing, and is journalled in a bronze bearing, that is adjustable endwise for centreing the cutter. The drive is through a worm wheel, with means for taking up end thrust wear of worm. The cutter end of spindle is provided with a taper hole for receiving the cutter arbor; this arbor is keyed in the spindle, and is drawn in and forced out by a threaded bolt. A removable bearing is provided for supporting the outer end of cutter arbor. Six changes of speed are provided for wheel quickly and brought back into the exact meshing depth, or the worm can be disengaged from the index gears and rotated any desired amount for resetting work, and again secured to the index gears.

The indexing mechanism is so interlocked with the cutter slide feed that it is impossible for the cutter to advance until the work is properly indexed, or when the cutter is feeding to index, thus making it impossible to spoil work. The work spindle can be made to space once or revolve continuously by a hand movement, under control of the operator. The friction operating the disc stop is simple and accessible, as it is not necessary to dismantle any part of machine to adjust it; a minute's use of a pin spanner wrench does it. Index gears are furnished to cut all teeth from 12 to 100 and, with the exception of prime numbers and their multiples, from 100 to 450. Special change gears can be furnished to cut other numbers of teeth.



A 11.—Friction Assembled and in Detail.



A. 12.—Inverted View of the Cutter Saddle, Showing the Method of Taper Gibbing both Vertically and Horizontally.

length of feed of cutter slide, are operated by a crank wrench from the front of bed. A retractable tappet, for ad- the cutter spindle. The indexing mechanism is of simple construction. The index worm can be disengaged from the Both over head and outer supports for the work arbor, and rim support for gear blanks, are furnished. The machine

is regularly equipped with a countershaft, though if desired, will be furnished with T. & L. pulleys mounted on the initial shaft, and also arranged for motor drive, if desired.

The machines are built by the Cincinnati Gear Cutting Machine Co., Cincinnati.

"LAFFITTE" WELDING PLATES.

Fig. 1 is a section of Laffitte plates made in one size 4 x 8 ins., and is

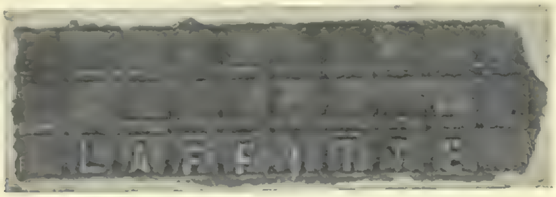


Fig. 1.—A Section of Laffitte Plate Reduced.

chequered so that a piece of any size can be broken off by hand without loss or waste.. It is made in two weights—the heavy for all ordinary work, and the

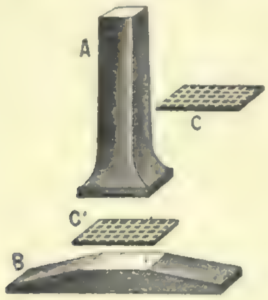


Fig. 2.—Application of Plate for Welding.

light for spring steel, small angles, etc. One plate is sufficient to make from half a dozen to one hundred welds. The chemical action of the plate increases

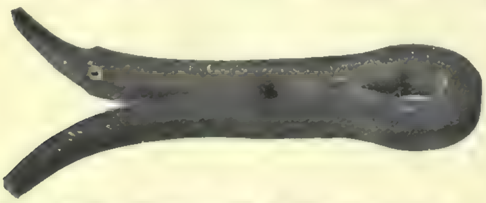


Fig. 3.—File Welded with a Plate and Hole Punched While Hot.

instead of decreases the strength of the weld.

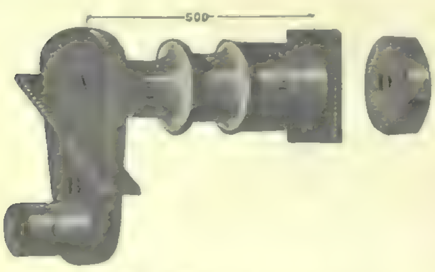


Fig. 4.—Butt Welding a Crank Shaft.

The plates are used in a simple manner, as the two parts to be welded are heated to a cherry red if steel, or a white heat if iron. A piece of plate of sufficient size is then placed between the two parts, as shown in Fig. 2. Then press together until the plate fuses, hammer lightly and complete by hammering the usual way. The piece may then be reheated to any desired heat without endangering the weld.

A feature of the plate weld, is the fact that a homogeneous joint is secured. . It becomes one solid mass, with the strength of the original. In many cases the strength is materially increased, as in the case of steel castings.

The plates are used to weld iron to iron, iron to steel, steel to steel, ma-

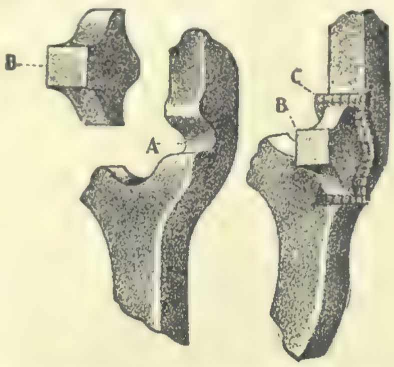


Fig. 5.—Method of Repairing Steel Castings.

chinery steel, tool steel, steel castings, copper to steel and copper to copper. Blacksmith's find the plate method of welding economical.

Laffitte plates here described are manufactured by the Phillps-Laffitte Co., Philadelphia, Pa.

GORTON CUTTING-OFF MACHINE.

Essentially the cutting apparatus in this machine is a second-order lever which, by providing the maximum of support, makes possible the application

Fig. 2.—Main Driving Gear With Cutter Drum and Blade Complete.

of great power without distortion and consequent vibration. Applied to the cutting off of bar material by a rotary cutter this involves passing the work through the cutter, which takes the form of a disc of relatively large diameter with a central opening about which the cutting teeth or tools are either formed or secured and the provision of means

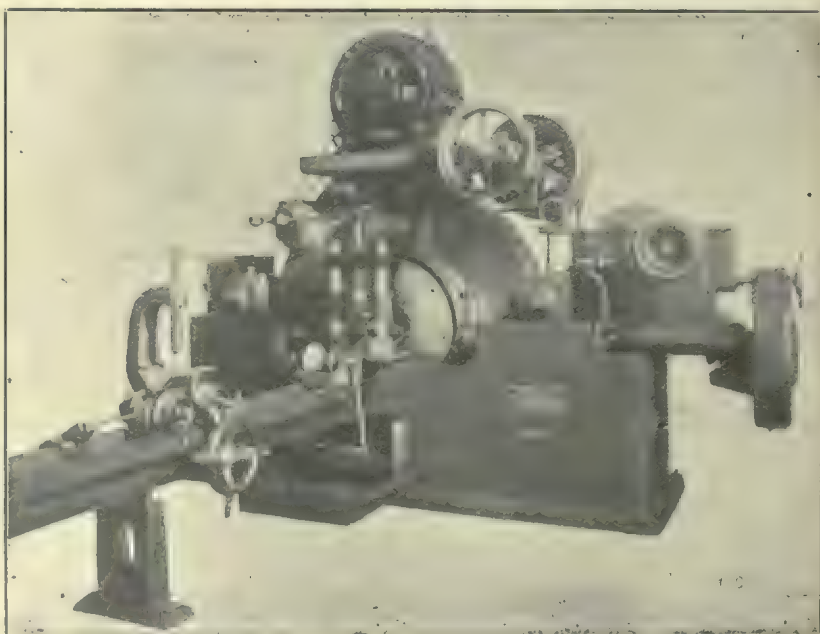


Fig. 1.—Front View No. 2—B Gorton Cutting-off Machine.

for either feeding the work across the disc or vice versa.

A gear of large diameter, with an elongated hub running in suitable bearings and with an internal diameter sufficient to take the stock and allow of a transverse feed at least equal to the greatest diameter of work fulfils these conditions and constitutes the central feature about which the machine shown in Fig. 1 is built. In this design the work is clamped rigidly upon a stationary bed and the entire head carrying the gear, with drive, is fed across the bed.

Fig. 2 shows the drum gear dismounted and shows clearly the construction of the cutter disc and method of securing to hub, by means of dowels and screws.

This machine has a capacity for bars up to 6 inches, which it will cut off in less than one minute, though the makers say that no tool steels yet available will maintain this rate; the machine, therefore, is somewhat in advance of steel development. The speeds are calculated for 76 feet per minute at the cutter teeth and the feeds have seven changes for 13 inches to 6 inches per minute. A geared pump delivers lubricant to the cutter teeth. The machine is designed upon absolutely sound principles and should be capable of rendering the constant hard service for which its makers say it was designed.

BORING, DRILLING AND MILLING MACHINE.

The horizontal boring, drilling and milling machine illustrated herewith is built by the Fosdik Machine Tool Co., Cincinnati, O., and represents their latest design. This machine is built in two sizes, Nos. 1 and 2, and is capable of performing all the operations of drilling, milling, tapping, boring, facing, etc., on light and heavy work in the most efficient and accurate manner.

The column carrying the spindle head has horizontal movement on the bed by hand or power in both directions; also a quick forward and return motion by power, operated by a lever conveniently located on the front of bed.

The head which is counterbalanced and provided with a safety chain, has vertical movement on the column by hand or power in both directions. For quick adjustment the pilot wheel on the front of the spindle head is used.

The spindle sleeve runs in adjustable bronze bearings and has a thread cut on its front end to hold chucks, large milling cutters and facing heads for heavy work. The spindle bar which passes through the sleeve is driven by two keys, and is fitted with a No. 5 or 6 Morse taper, and provided with a cotter key to be used when driving large boring bars. It has a power and hand feed in both directions.

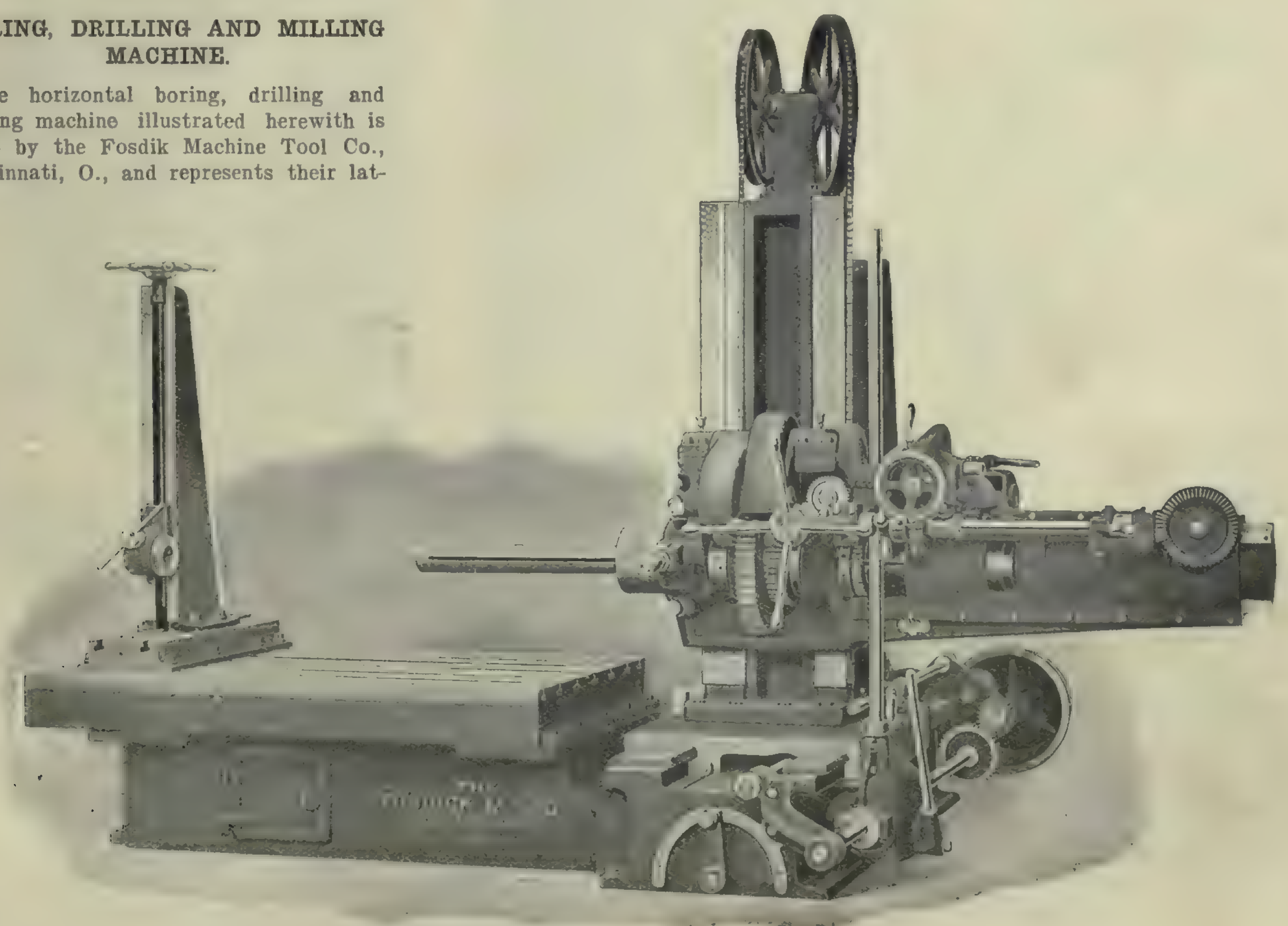
The spindle driving gears are located on the spindle sleeve close to the work. This construction reduces the torsional stresses in the spindle to a minimum, and is especially advantageous when using large milling cutters, as it practically eliminates all chattering. The back gears are of the tumbler type, and can be engaged while the machine is in motion by means of a lever conveniently located on the head.

The outer support for boring bars has horizontal and vertical movement by hand and is provided with scales, same as are fitted to the main column and bed.

The table in which the T-slots are planed, is stationary and securely bolted to the base and bed, insuring perfect alignment with the spindle at all times.

There are eight changes of feed, ranging from 7-1000" to ¼" per revolution of spindle. Sixteen changes of spindle speeds, ranging from 4 to 260 r.p.m., are secured either through the cone pulley or speed box, by using a double speed countershaft.

For a constant speed motor drive a 7½ h.p. motor, 825 r.p.m., is mounted on the rear of the machine and connects through gearing to the speed box. For a variable speed motor drive a 7½ h.p. motor, 400 to 1600 r.p.m. is used and is mounted on the rear of the machine and connects through gearing direct to the driving shaft. The controller is mounted within easy reach of the operator.



Fosdick Horizontal Boring, Drilling and Milling Machine.

POWER GENERATION AND APPLICATION

For Manufacturers. Cost and Efficiency Articles Rather Than Technical.
Steam Power Plants ; Hydro Electric Development ; Producer Gas, Etc.

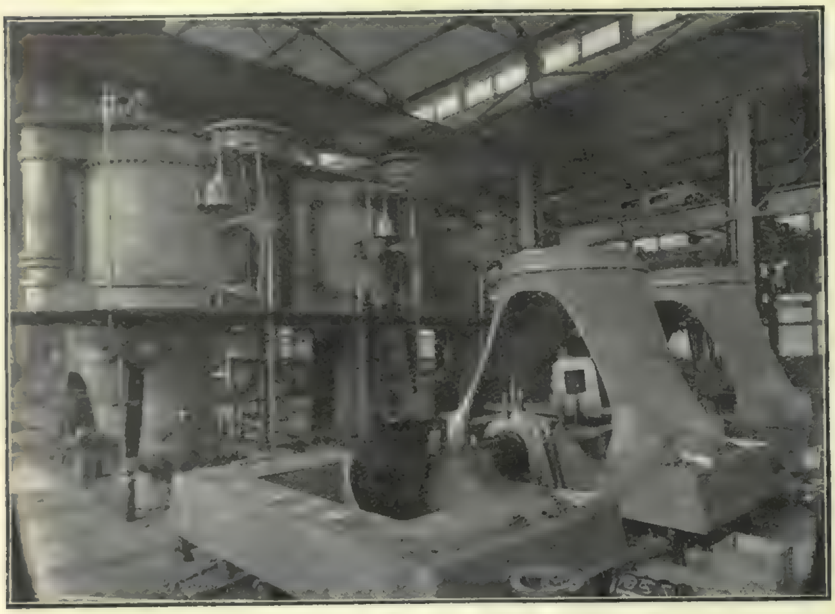


Fig. 1.—Inglis 15,000,000 Gallon Pumps and Engine.

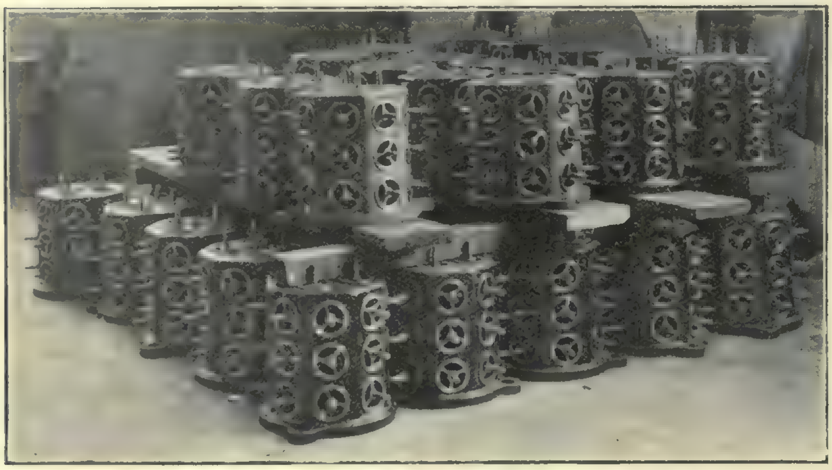


Fig. 2.—Forty-two Cages. Each Having 28 Valves. Inglis 15,000,000 Pumps.

Fig. 7.—Machine Shop of John Inglis & Sons, Toronto.

SOME LARGE POWER MACHINERY IN COURSE OF CONSTRUCTION.

The growth of Toronto has necessitated the addition of some large pumps and engines to the pumping stations. The one illustrated in Fig. 1 is under construction at John Inglis & Sons, Toronto, and will be erected in the main pumping station, John Street. The contract for the pump was awarded in February, 1908, and it is expected that by February, 1910, the erection of the pump in the John Street station will be completed.

Fig. 1 shows the cylinders and bases of the engine and pump, with the base of the low-pressure cylinder removed in order to show the valve mechanism of the pump. When in place, the pump will be 52 feet in height, and have a

Fig. 3.—Low Pressure Cyl., Inglis 15,000,000 Pump and Engine.

capacity of 15,000,000 gallons every 24 hours. It is a direct-flow type, that is, the water always flows in one direction. The cylinders are 32, 60 and 90-in. in diameter, with a 60-in. stroke. The floor space covered is 16 feet by 32 feet.

The pump cylinders were cast in the foundry of John Bertram & Sons, Dundas. The low-pressure cylinder weighs twenty tons, and the others 22,810 lbs. and 19,320 lbs. The steel for the engine, including the crank shaft, was furnished by the Nova Scotia Steel & Coal Co.

The pump valve cages are shown in Fig. 2, and are 42 in number, each containing 28 brass pump valves, 3⅝ ins. in

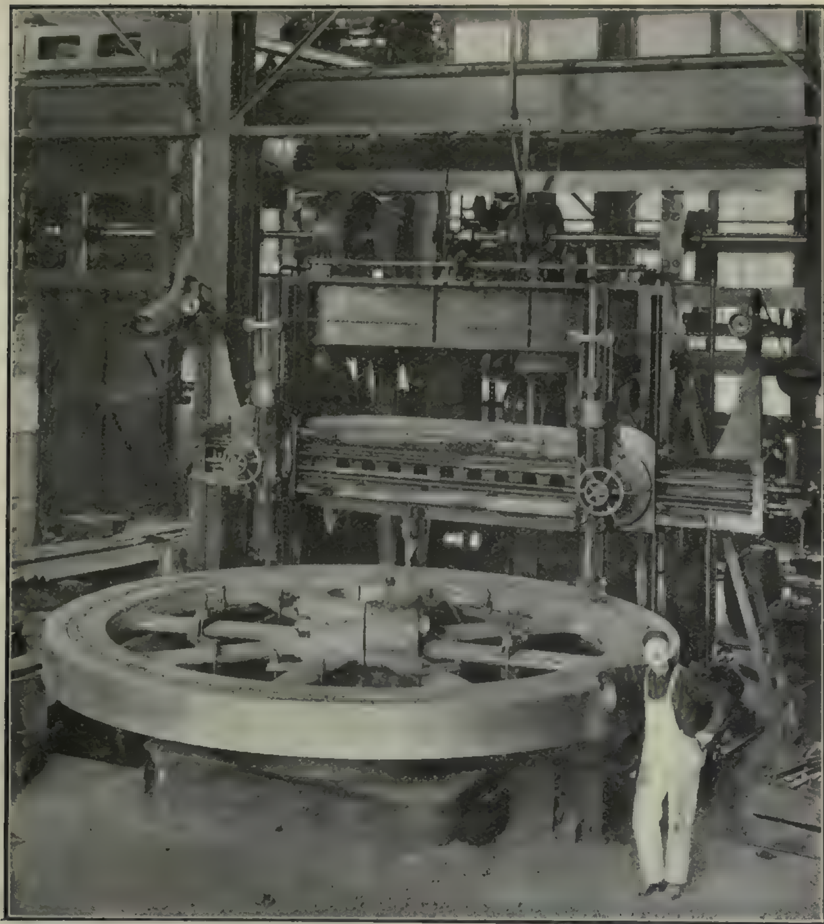


Fig.4.—Turning One of Large Flywheels for 15,000,000 Gallon Engine and Pump.

diameter. The cages are made secure to separate, vertical cast steel valve decks.

The crank shaft in its finished condition weights 15 tons. It is 23 feet between the pins, is 17 inches in diameter at the bearings, and 19½ inches where the fly-wheels go on. The cranks are in two pieces, and pressed on at 200 lbs. pressure. The high and low crank pins are 8 inches diameter by 8 inches long, while the intermediate is 12 inches diameter, by 8 inches long.

Fig. 3 shows the low-pressure cylinder, which is 90 inches in diameter. The large castings for the pump were made in the foundry of the Berg Machinery Co., Toronto. All the large pump connections were made under the direction of David Reid, superintendent of the Berg Machinery Co.

Fig. 4 shows one of the large flywheels, 15 feet in diameter, being turned. Fig. 5 shows the manner of connecting the flywheels, which are made in halves. The steel rods are heated, and when in position are allowed to cool, shrinking 1-16 inch, thus holding them closely together. The wheels are 19½-inch bore and 14-in. face.

Fig. 6 is a Corliss engine for Kew Beach Sewage System, Toronto. It is a compound engine with the high and low-pressure pistons on one piston rod. The cylinders are 12-in. and 24-in. by 30-in. stroke. A receiver connects the two cylinders.

Fig 7 is the main bay of Inglis machine shop, A and B are flywheels for the 15,000,000 gallon pumping engine, C is engine shown in Fig. 6, D is large pipe connection, E is large pipe connection F is base of low-pressure cylinder, G is a collection of 42 valve cages shown in Fig. 2, H is the large 15,000,000 pumping engine in course of erection. A large electric crane is used in this bay to move the large castings to place desired.

Fig. 6.—Kew Beach Engine.

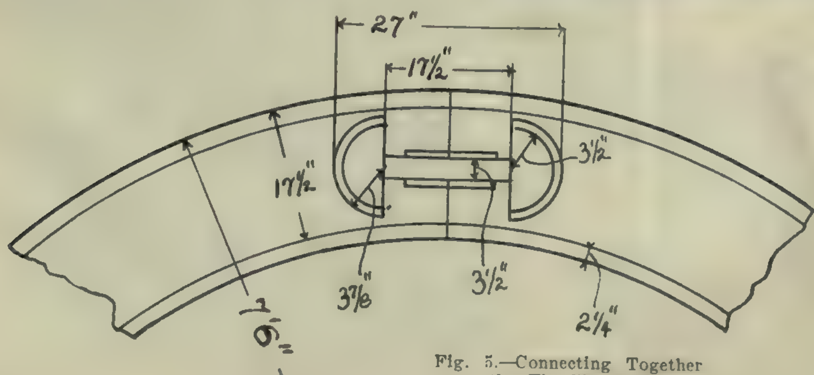


Fig. 5.—Connecting Together the Fly Wheel Parts.

DEATH OF ROBERT McKECHNIE.

Robert McKechnie, who died at Dundas, Ont., Oct. 16, was partially responsible for the early development of machine tool building in Canada. He learnt pattern making in the old Gartshore foundry and then later started manufacturing. John Bertram became a partner and their company, the Canada Tool Works, became well known. In 1886 he retired, leaving John Bertram to continue the business.

CANADIAN MACHINERY
AND MANUFACTURING NEWS

A monthly newspaper devoted to machinery and manufacturing interests mechanical and electrical trades, the foundry, technical progress, construction and improvement, and to all users of power developed from steam, gas, electricity, compressed air and water in Canada.

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Vol. V. December, 1909 No. 12

TECHNICAL EDUCATION.

Slowly but surely the question of technical education for mechanics and apprentices is receiving attention. The Provincial Government of Nova Scotia has taken up the question with the result that a comprehensive system of technical education has been developed, which is an example for the other provinces. This system was described in February, 1909, issue of Canadian Machinery. The department of technical education has been established in Nova Scotia for two years and schools have been established in twenty-one industrial communities, with an attendance of over 1,400 students in the different courses during the year.

In Quebec there are 11 schools of arts and manufactures. Among the subjects treated are drawing, woodwork, metal work, etc. Montreal is a leader in technical education in Quebec Province. Early in October the corner stone of a large provincial technical school, which will be complete in all its branches, was laid in Montreal. There will also be a provincial institution in Quebec.

Prince Edward Island, New Brunswick, British Columbia, Alberta, Saskatchewan and Ontario Governments have done practically nothing for technical education. It is a tribute to the progressiveness of those cities that have investigated the needs of a growing industrial nation and have endeavored, at least, in a measure, to meet the demands for artisans by developing young men along practical lines. Many Ontario towns and cities have begun courses in manual training, which will develop into more complete courses.

Hamilton, one of Ontario's busy industrial centres, has dealt with the question in a gratifying manner. A well equipped technical school has been erected, where courses will be given in practical work, including forging, woodworking, metal working, work in electrical laboratory, etc. In all cases practical work will be accompanied by instruction.

The railroads have their own systems, and they are excellent, but in many growing industrial centres there is nothing of this nature for a young man. He enters a shop as an apprentice and picks up knowledge the best way he can. In Nova Scotia the question has been properly dealt with and Quebec is beginning its scheme. The other provinces, especially Ontario, which is the manufacturing province, should adopt an organized scheme for technical education. The scheme will cost money, but it will be worth it, and it will be supported by both the manufacturer and the public generally.

CAMPAIGN FOR UNIFORM BOILER LAWS.

For several years Canadian Machinery has followed closely the campaign to secure uniform boiler legislation in the various provinces of Canada. The manufacturers and engineers of Canada have recognized fully the importance of building boilers acceptable in any province in the Dominion. Now the realization of the hopes of both the manufacturer and consumer is in sight. For several months J. W. Harkom has interviewed the men in charge of boiler inspection, construction and stationary engineering departments, with the result that British Columbia, Alberta, Saskatchewan, Manitoba, Ontario and Quebec will be represented in a conference at Regina December 1, 1909. The representatives will attend with instructions to consider the act prepared by the Boiler and Engine, and Boiler and Thresher sections of the Canadian Manufacturers' Association, and bring to the Provincial Governments recommendations which can be adopted by them and stimulate, instead of retarding, the trade between provinces.

As the laws stand at present, a boiler built to the specifications of one province will not be acceptable in another province, and the effect has been to stop, or at least curtail, business carried on between provinces. This appears to us to be striking a blow at the British North America Act of 1867. One of the important features of the act was to remove the barriers preventing provinces trading with each other.

The benefits of a uniform law are threefold: (1) The manufacturer will be able to build a number of boilers on the same pattern, allowing him to build a better boiler at less cost, because the numerous patterns, templets, etc., are done away with, and workmen can become more efficient; (2) The consumer will know that he is getting a good boiler that can be used in any province; (3) any engineer securing a certificate in one province and moving to another will not have to pass examinations in all the provinces in which he may reside.

The act and regulations that have been prepared cover the ground very thoroughly. The differences in opinion manifested by the legislation in the various provinces should be easily reconciled. The time has arrived when greater protection is necessary, to which recent explosions testify. A strict, uniform law will carry out the spirit of the British North America Act, and will protect to a greater extent, life and property, and guarantee to the user that all precautions have been exercised in the manufacture to secure for the user a well-constructed boiler.

INSURANCE AGAINST UNEMPLOYMENT.

A question which is exciting a great deal of attention in England at this time is, that of insurance against unemployment and an experimental plan to be presented to the British Parliament.

Whether or not the effort to make such insurance compulsory by parliamentary enactment as to certain industries will be successful can not now be foretold, but it is evident that an earnest effort will be made to secure the passage of such a law. The proposed legislation, as recently outlined by the president of the British Board of Trade, will embody these three cardinal features—it will be compulsory, contributory, and specialized as to different groups of trades.

It is claimed that the futility of voluntary schemes of insurance against unemployment have been caused by the fact that the majority of those interested in such schemes have been themselves out of employment, and consequently unable to make the necessary payments. Contributions from employer and employee are regarded as essential in order to secure stability and permanence to the undertaking, and it is believed that the wage-earner, with the assurance that he will be provided for in a time of misfortune and distress, will be less inclined to engage in strikes, and that a larger measure of peace will be thereby obtained for the industrial world.

The division into trades, it is urged, will solidify the interests of employers and employees, and if there should be a depression in one trade the scale of contributions or allowances could be changed without affecting other industries.

The trades of building, shipbuilding, engineering, construction work generally, and vehicle making have been subject in the past to the most serious fluctuations, and it is in these trades that the insurance against unemployment will be first made applicable. One-third of all the employes in the United Kingdom in what may be called purely industrial occupations are engaged in the said trades.

It is intended, if the law is enacted and proves effective, to enlarge its scope from time to time so as to include other trades, giving the preference to those trades in which it may be inferred from past experience that frequent, violent, and sustained depressions are most apt to occur. It is expected that the contributions required from the State, the employer, and the worker will be about 5 cents a week each. The amount paid by the wage-earner will be stamped weekly upon his insurance card. This card will also show the weekly contribution by the employer.

The labor exchanges and the insurance against unemployment will be closely associated, and through this cooperation it is anticipated that the disturbances which now agitate the labor market through a superabundance of workers in certain trades or in certain localities and a scarcity in others will be largely avoided.

The wage-earner when out of employment must report to the nearest labor exchange, and through it an effort will be made to find work for him. He will be paid nothing out of the insurance fund during the first week that he is unemployed, upon the assumption that he has probably saved enough to tide him over that short interval. If work is secured for him he must accept the employment unless he can furnish a satisfactory reason for not doing so to a committee composed of employers and employes, which will be constituted to decide the contention. If he is willing to work and employment for him can not be found, then he is to receive ordinarily $1.92 per week for fifteen weeks if employment is not secured during that period, or for a longer period (but in no event to exceed twenty weeks) if he receives a smaller weekly benefit.

If he makes an application a second time he must contribute to the insurance fund for a longer period than the first time. The original period during which he must contribute to the fund before he can receive insurance benefits would probably be eight months, and the second or third periods, if he should make three applications in all for employment, would be progressively longer. The insurance scheme, it will be thus seen, is not intended for the benefit of men habitually or chronically out of work, but for the steady and industrious wage-earner who temporarily has no employment.

It is estimated that the contribution to the insurance fund by an employer of 500 men would not exceed $1,200 or $1,450 a year. Arrangements, it is suggested, should be made to enable individuals or associations of workmen who are not employed in the insured trades to insure against unemployment through the Government voluntarily, but in such cases the terms of the insurance would not be as favorable to the employe as if he were engaged in one of the compulsory trades.

The proposed legislation has met with a varying reception from the large employers of labor and from the trade unions, some approving and others condemning it; but it can not be said as yet that there are any indications of organized and general opposition to the proposal of assurance against unemployed from either of these sources.

PRODUCTION OF PIG IRON AND STEEL IN CANADA.

The detailed figures of the pig iron and steel production of Canada for the half-year ending June, disclose a very gratifying state of progression. Not only was there significant increases in the totals over those for the half-year ending Dec. 31, 1908, of 96,524 tons in iron, and 84,-333 tons in steel, but every individual line showed an advance. It can thus be seen that the general increase was not due to any unusual inflation of a particular line, but to an improvement in every branch—a sign of a stimulated demand from a predominating number of most important industries.

As iron and steel closely indicate the prosperity of a country, Canadians can appreciate how prosperous trading conditions must have been during the first half of the year, and what gratifying totals are promised us at the end of the year. The steel details are particularly interesting. Rails, for instance, show an increase of 34,364 tons; structural materials, etc., of 14,077 tons, and plate, axles, spikes and other sundries of 1,292 tons over six months ending Dec., 1908. These figures indicate how railroad purchasing improved, and how the construction shops, the contractors, and other industrial corporations developed in their production.

As can be imagined, no plants have been dismantled, while, on the other hand, the different iron and steel corporations have been making extensive additions to their furnaces, mills, etc., to cope with the demand. Ten furnaces were in blast during the half-year.

The Dominion Iron & Steel have put into construction or are projecting, 120 improved Otto Hoffman by-product coke ovens and accessory plant and equipment; an additional fifth blast furnace with stoves, etc.; two 400 to 500-ton open hearth steel furnaces; an additional, third,

Bessemer converter, and a turbo-generator plant for utilization of waste steam and generation of electric energy—to replace present direct steam generation system and afford sufficient additional current to electrify the company's pumping station. There will probably be some additions to present mill equipment to take care of the increased tonnage of steel that will be produced by the enlargements previously noted.

The Atikokan Iron Co. blast furnace was blown in during the second half of the year. The Hamilton Steel & Iron Co. are building a new Gayley dry air blast equipment. It is also announced that a new bolt and bar mill will be built, and that the company will do business on a much larger scale, entailing an expenditure for new works of over a million dollars.

Lake Superior Corporation are erecting one new blast furnace with a capacity of 400 tons per day, and one 12 and one 18 merchant mill with a capacity of about 400 tons per day. An enlargement of the rail mill is contemplated. Four thousand men are now being employed on full time.

	Half-year ending Dec. 31 tons	Half-year ending June 30. tons.
Total iron production	257,359	353,883
Total ingot steel	253,693	338,026
Details.		
Pig iron—		
Basic	130,255	173,745
Bessemer	55,008	99,638
Malleable	897	6,259
Foundry	61,199	74,241
Steel—		
Ingots	253,693	338,026
Blooms	187,309	218,752
Billets	28,839	29,714
Rails	131,250	165,614
Wire rods	25,333	29,083
Bar steel, iron and structural material	44,285	58,362
Castings	4,535	7,318
Plate, axles, spikes and sundries	3,085	4,377

SECRET COMMISSIONS ACT.

The following letter from a prominent Toronto business man illustrates the importance of the act :

> Editor of Canadian Machinery,—In the October issue of your journal you reprint and call attention to the Secret Commissions Act, which was passed at Ottawa last session. This piece of legislation has not received the attention that it deserves, and, in fact, is almost yet unknown, as a law, to the great majority of citizens of the Dominion. You are undoubtedly doing a great public service in bringing this act before your readers, and it is to be hoped that other publications will follow your good example. All papers should freely comment upon it. It is a case where the necessity of such a law being properly observed should be "pounded in" everywhere.
>
> Too much publicity cannot be given to the fact that our corrupt business methods have forced such legislation, and in response the act has been brought into existence and stands upon the statute book, with the severe penalties therein prescribed for infraction of same.
>
> Attention should be called to the alarming increase in the petty bribe and graft custom in our business life in Canada ; in this particular we seem to be following closely the regrettable usuages of our neighbors south of the line, although the Old Country is not a stranger to it.
>
> This matter is more important and far-reaching than is generally supposed ; in some lines of business it amounts almost to blackmail. Some Government and municipal employes look for a commission, and trade is only secured through this channel ; purchasing agents in large concerns have to face it, and in some cases suggest it ; many engineers are "fixed" to report on oils, etc., and qualities and quantities used, as well as prices made, are in accordance with the "fixing" regulations ; printing inks and various other supplies are thus often bargained for. In fact, this dishonest and debasing process runs through so many avenues and lines that it is impossible to enumerate them. It destroys all fair competition and is utterly demoralizing to the individual and the nation.
>
> In the interests of common honesty, business integrity and good citizenship, this abuse should be stamped out. It curses "him that gives and him that takes."
>
> TORONTO BUSINESS MAN.

In New York manufacturers are having trouble with secret rebates and the practice is strongly condemned by the New York Journal of Commerce. An act such as the Canadian Secret Commissions Act, would evidently be very acceptable to those who have to put up with the unfairness caused by giving secret rebates.

The Journal of Commerce says under the heading "Rebating is Dangerous" :

> One of the propositions which causes the wholesaler about as much trouble as any other is that of the practice on the part of the traveling salesman of giving rebates from his pocket. It is a two-edged sword, which hits both at the house and at the salesman. Besides the direct money involved it often places the employer in a position where the employe does something that causes much embarrassment in more ways than one.
>
> Too often the salesman is anxious to make a record of selling a large amount of goods and sends in his orders at regular prices, but digs down in his pocket and hands back to the buyer enough to make up the difference in the figures between what he should get and what the buyer is willing to pay.

We believe this act to be to the interests of business men, and it is hoped everyone will assist in its enforcement. Canadian Machinery intends giving publicity to everything which will place the mechanical men and the manufacturer on a higher plane. We believe the enforcement of this act will do this and assist in the building up of honest men who can be trusted to do the right things wherever they are employed.

"Take some serum from a cost system and inject it into your backbone" — F. I. Ellich.

CANADA'S GROWING TRADE.

During the decade from 1898 to 1908 Canada led the world, with the exception of Argentina, in comparative increase in trade. During the preceding decade, from 1897 to 1907, Canada ranked third in respect to trade growth, Argentina first and Japan second. Japan now ranks third. This is the most interesting fact brought out in the annual report of the Trade and Commerce Department recently issued.

Statistics of canal traffic for the six months ending September 30th show a marked increase totalling about eleven million tons. The increase at the Sault canals was 10,500,000 tons, Welland 119,516, St. Lawrence 263,234, Chambly 163,079, Ottawa river 47,463, Rideau 650. The Trent canal alone shows a small decrease.

The customs collections for October show another gain of nearly $1,000,000, as compared with the corresponding month of last year. The total customs receipts for the month just ended were $5,236,737, an increase of $920,263. For the seven months of the fiscal year the total customs revenue has been $34,017,806, an increase of $6,838,614, or nearly $1,000,000 a month as compared with the corresponding period of last year. The rising tide of imports consequent upon the recovery from the trade depression of last year shows no sign of ebbing, and indications point to an increase of about $12,000,000 in customs revenue alone for the present fiscal year.

Canada's trade for October was $62,417,614, an increase of $5,189,061 compared with October of last year. Imports for the month totaled $31,473,960, an increase of $3,814,600. Exports of domestic products totalled $27,250,759, an increase of nearly one million.

For the first seven months of the fiscal year the total trade has been $366,807,482, an increase of $48,400,497, as compared with the corresponding period of last year. Imports totalled $202,787,905, an increase of forty millions. Exports of domestic products totalled $147,735,014, an increase of a little over eleven millions.

The total customs revenue for the seven months was $33,797,520, an increase of $6,787,452, or nearly one million a month.

The financial statement for the Dominion for the month of October, and for seven months of the current fiscal year, according to the returns of the Finance Department up to the end of October has been issued. The revenue for October was $8,553,766, an increase of $1,034,050, of which $897,696 was in customs revenue. For seven months the total revenue was $55,907,586, an increase of $7,660,348, or over one million a month, as compared with the corresponding period of last year. For the month of October, the expenditure was $6,710,684, a decrease of $1,106,938. For seven months the consolidated fund expenditure was $37,137,139, or $2,205,237 less than for the corresponding period of 1908. The surplus of revenue over ordinary expenditure is therefore nearly nineteen millions. Expenditure on capital account was $17,196,084, a decrease of $808,298, as compared with last year. The total expenditure on both capital and consoildated fund account for the seven months was $54,363,223, or $1,544,363 less than the total revenue, notwithstanding an expenditure of over ten millions on the National Transcontinental Railway.

The total net debt of the Dominion on October 31 was $321,727,816, an increase during the month of $1,029,352.

According to figures furnished by the Department of Land and Commerce, the Dominion Government since 1896 has paid out in bounties $16,507,205 of all kinds.

During the fiscal year which closed March 31, 1908, the total amount paid was $1,864,614, and for iron and steel as follows: Algoma Steel Co., Soo, $304,789; Dominion Iron and Steel Co., Sydney, $1,067,528; Nova Scotia Steel Co., $130,374; Hamilton Steel Co., $252,311; Canada Iron Furnace Co., Midland, $39,968; Canada Iron Co., Radnor Forges, $3,742; John McDougall and Co., Drummondville, $3,394; Lake Superior Co., Soo, $45,890; Ontario Iron Co., Welland, $6,887; Can. Iron Corporation, Midland, $9,295; and the same company for its Drummondville forges, $431.

TAKE TIME TO READ.

"I have no time to read." This is an expression sometimes heard by technical paper canvassers, and if it were as well understood by those who make use of it, as it is by canvassers it would not so frequently be expressed. Instead of being an excuse for not subscribing for a paper that will benefit the foreman, superintendent or proprietor, it is an admission of neglect to do what every progressive mechanical man is expected to do.

Technical papers are busily engaged in searching for new and progressive ideas, and are bringing the best that can be found to the attention of their readers who are continually making use of them.

A young man recently engaged in a business of which he has little knowledge. He has not the least inclination to read and therefore has little chance to learn. He is consequently not making headway and cannot understand what is the matter.

Another young man started under similar conditions, but he caught on to the idea that knowledge is the source of success. He devoted certain hours every week to the reading of technical literature, and he claims that his success, to a large extent, is due to the valuable information he obtains in that way. If a man has no taste for reading he should cultivate it; in fact should make himself read, and he will soon acquire a habit that will be beneficial to him. The man who does not read must not forget that others read him, and they soon find out that he is narrow in his views and selfish in his dealings.

It is even time well spent for mechanical men to take a look at other shops in order to get improved ideas, but what is that compared with the knowledge he can gather from his technical paper, which is on the lookout for the best systems and methods all over the world, and which are gathered up and brought right to his office or shop every month for his own benefit and at his leisure.

No time to read! One might as well say that he had no time to eat.

CAR SHORTAGE IN CANADA.

There is such a shortage of cars on the Canadian railroads that manufacturers and shippers find it difficult to make deliveries. It has been reported to Canadian Machinery that orders placed early this year have not been delivered through lack of rolling stock.

FOUNDRY PRACTICE AND EQUIPMENT

Practical Articles for Canadian Foundrymen and Pattern Makers, and News of Foundrymen's and Allied Associations. Contributions Invited.

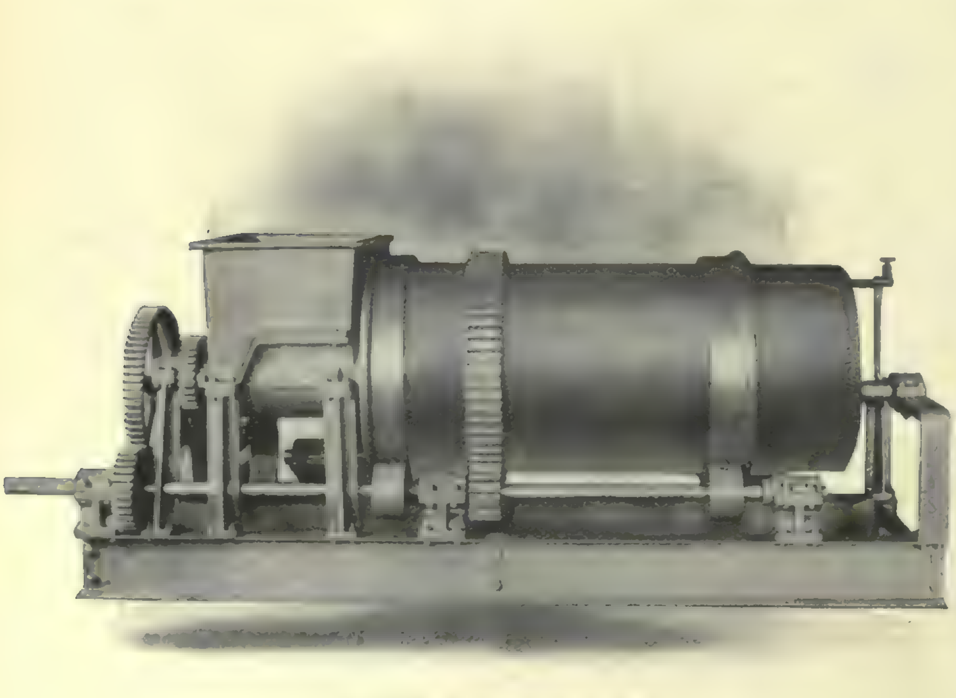
DETROIT CONVENTION OF THE AMERICAN FOUNDRYMEN'S ASSOCIATION, 1910.

The committee appointed on behalf of Detroit foundry and foundry supply interests to arrange for the convention of the American Foundrymen's Association in Detroit in 1910, had a meeting on October 12, at Detroit, with the officers of the Foundry and Manufacturers' Supply Association. The Detroit committee offered as a meeting place the fair grounds, located on Woodward Avenue. The time most suitable to the local committee, it was stated, is the week opening May 30, but the dates have not yet been definitely determined. The representatives of the foundry supply interests expressed approval of the site. The completion of the arrangements was left in the hands of President F. N. Perkins of the Foundry and Manufacturers' Supply Association, to co-operate with the Detroit committee.

A number of entertainment features are proposed, including a boat ride on the Detroit river for all attendants at the convention, a smoker for the men, a drive about the city and a theater party for the ladies. Frank T. F. Stephenson is chairman of the Detroit general committee and his associates are the following chairmen of sub-committees: Frederic B. Stevens, finance committee; Joseph J. Wilson, plant visitation committee; James S. Keightley, reception committee; W. P. Putnam, convention sessions committee; Melvin Henry, ladies theater party and sight seeing committee; E. J. Woodison, smoker and get-together entertainment committee, and Oliver Phelps, boat ride committee. The Detroit Foundrymen's Association, has as its president, Arthur T. Waterfall, who is also president of the American Foundrymen's Association for the present year.

McCORMICK CONTINUOUS SAND MIXER.

The sand mixer shown in the accompanying illustration, is so constructed that wear on the operating parts, as a result of the abrasive action of the sand, is reduced to the minimum. Sand is fed into a hopper containing two feed worms or screw conveyors, which deliver the material to a revolving drum, inside of which is a rotating reel operating in the same direction as the drum. This reel is so constructed that it thoroughly mixes and cuts the sand before it is discharged from the machine.



McCormick Continuous Sand Mixer.

At the discharge end of the drum is a device for tempering the material as it is being turned over. The machine can also be arranged as a proportion mixer by placing a partition in the hopper and operating the feed worm at different speeds by the use of sprocket wheels. In this way facing and core sand can be accurately mixed. The machine is built in sizes having capacities from 10 to 15 tons per hour, by the J. S. McCormick Co., Pittsburg.

WRINKLES FROM A PATTERN SHOP.

By P. Maker.

The writer has worked at wood patternmaking the past 25 years. The greater part of this time was spent in shops in large cities. Six months ago I thought I would try a shop in a small or medium-sized town. About seventy-five machinists and three patternmakers are employed with three machinist apprentices and one patternmaker apprentice. Practically all of the small tools were made by these apprentices in a workmanlike manner.

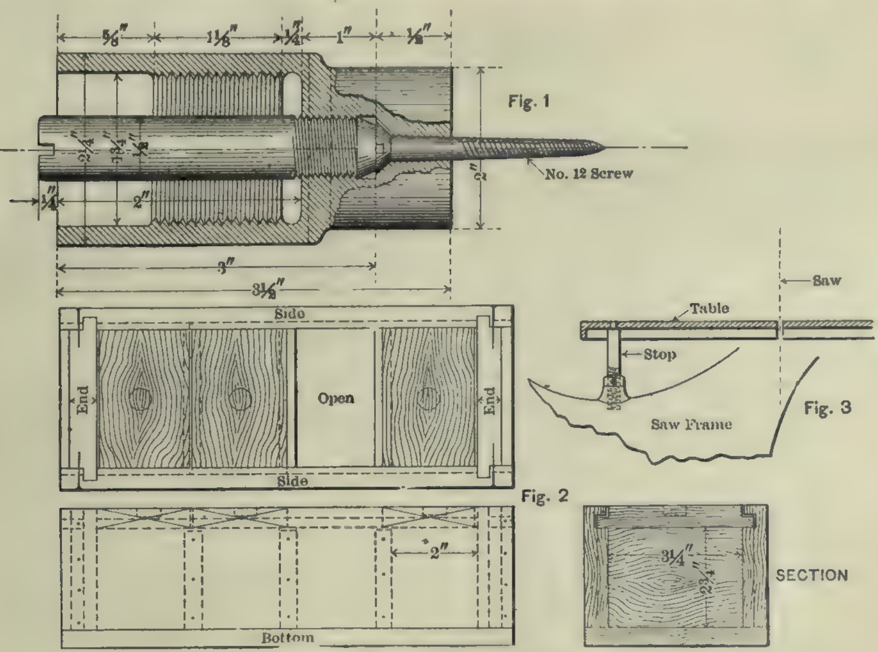
Fig. 1 shows a screw chuck made of cast iron; it is without a doubt the best chuck that I ever used or saw. It is made long enough so that a firm grip can be taken to remove it from the lathe. The threads are cut away to insure a straight start on the spindle. It is drilled and countersunk for a No. 12 screw which is secured in place by a ½-inch setscrew which is nothing more than a common ½-inch bolt with the head cut off and a saw-slot cut in as shown. The screw can be removed and another put in in less time than it takes to think about turning a thin disk to place back of the work. The small face-plates are fitted with this screw.

The large wood face-plates vary in size from 2 to 6 feet in diameter. Each of these is fitted with an iron face-plate which is never removed until the wood plate is out of use.

Fig. 3 presents a band-saw table stop which was designed and made in this shop. The old stop was a simple set-screw and locknut which was removed and in its place was put a stud with a shoulder pin. The table rests on the shoulder, the pin passing through a hole in the table and finished flush with the top. With this device a workman can

detect at a glance if the table is in a correct position or not.

Fig. 2 is a simple shop requirement, one that is in constant use but given little attention. It is for brads, screws, etc. Three of these are made for each bench. One is for very fine brads, one for heavy brads and one for screws. It is made up of several compartments each about 2 by 2¾ by 3¼ inches. It has individual covers over each pocket, excepting one as shown. Only the one is open which contains the nails or screws required. The contents of box are never mixed up, it is always clean, and the contents of one can be removed without disturbing the other castings.



Kinks for Patternmaking.

HOW THE "OLD MAN" WAS WON OVER.

"Along early in the winter," said the foundry foreman, "they called me over to headquarters, up to the drawing room. The old man was there, studying blue prints for some new cylinders he had been working out with the chief draftsman. They must have stayed up nights on the job, for the drawings were fancier than anything they'd ever sent to the foundry. The old man went over them with me.

" 'Can you get 'em out?' he asked.

" 'I can try,' I told him.

" 'You can try?' " said the chief draftsman. 'Is that all you can do? Anybody can do that much, and we're giving you credit for being a first-class foundryman.'

" 'Now look here,' I said to him, 'I might tell the president I could get out that casting, and probably I could. But I'd only be guessing about it. I don't know sure. Now, why isn't it a blame sight better for me not to be too everlastingly positive till I'm certain I know what I'm talking about?'

"Then I asked the president to let me tackle the hardest proposition of the lot, and he said to go ahead. Well, the casting turned out bully, smooth and true and without the sign of a flaw. They were as tickled as could be up at the office, particularly the old man, who called me up to talk it over.

" 'I guess there isn't much doubt now that you can turn out that cylinder according to the design,' he said.

" 'You're satisfied with the casting?' I asked him.

" 'Why, yes,' he said. 'Certainly I'm satisfied.'

" 'Well then, I'm not,' I told him. 'That's only a trial casting and you're not counting on using it. Now I want it cut up so that we can see what the cylinder looks like inside. Judging from outward appearances, it's all right, but maybe there's something out of the way that we can't see. It might be a good while before we would discover anything wrong. A lot of these cylinders might have gone out onto the market, and they wouldn't be doing our reputation any good. I want this one cut up so that we will know it's in first-class shape inside and out. Then we can go on with the others.'

"The old man thought this was a good idea, and we tried it. We didn't find anything wrong inside the cylinder, but I've noticed that lately they've been calling me up to the office more and more, and from the way the old man talks, I believe he's coming around to the place where he sets some store on what I've got to say about any troublesome little job that turns up."—Foundry.

PLUMBAGO.

The United States imported in the fiscal year 1908, 13,398 tons of plumbago, orth $1,206,016, nearly all from the British East Indies. Canada supplied only $14,054 worth, but this total is likely to be given a boost. According to the U S. representative at Kingston, the shipment of plumbago has largely increased from that consular district of Ontario Province during the past six months, due to the discovery of an extra quality of the material and the increased demand in the United States. It is mostly mined at Calabogie, some 90 miles north of Kingston. H. D. Van Sant further reports that the prospects are for largely increased shipments during the coming year, and more machinery is now being installed at this mine. American capital is backing the enterprise.

IMPROVING ALLOYS WITH MANGANESE.

Boileme (La Fonderie Moderne) prepares high-grade copper-manganese by placing 75½ lbs. of broken or powdered manganese (98 per cent. pure, and free from iron and carbon) in a graphite cruicible and covering it with about 1 lb. of borax, the crucible being then filled up with 154 lbs. of copper, which is also covered with borax. The charge is heated for about two hours in a coke furnace, and when all the floating fragments of manganese have disappeared the product is cast into ingots, which are hammered to expel the scoria. Manganese-zinc and manganese-tin are prepared in the same way, except that the manganese is not added until the other metal has melted.

The addition of manganese (maximum 6 to 7 per cent.) to bronze gives a softer and more homogeneous metal by increasing the malleability and ductility of the alloy. The manganese is added in the form of copper-manganese or zinc-manganese. It must not, however, be added to bronzes containing over 2 to 3 per cent, of tin, as decomposition is produced and the quality of the alloy is impaired. About ¼ to ½ per cent. of Mn in white metal gives the product a silvery appearance, increases density, and facilitates working.

Added to nickel, 2 per cent. of manganese prevents the formation of bubbles in the castings and increases the fineness of the grain. Copper-manganese containing 30 per cent. of Mn (free from iron) may be used with advantage to replace zinc and nickel in aluminium alloys. From 4 to 6 per cent. of pure manganese forms a useful addition to the copper stays of locomotive fireboxes —the presence of iron would considerably lessen the resistance of the metal to fire-heat.

Manufacture of Cast Iron Pipe: Anthes Core Machine

Process of Manufacture Used in the Anthes Foundry, Toronto—Machines do a Large Part of the Work—Well Lighted and Modernly Equipped Plant

Back in 1894 H. W. Anthes and E. W. B. Snider established a soil pipe plant on Niagara Street, Toronto, under the name of the Toronto Foundry Co. In 1900 a charter was secured as an incorporated company with Mr. Snider as president and his two sons, W. W. and C. W. as vice-presidents, Mr. Anthes continuing in charge of the industry as general manager, while his son, L. L. Anthes, was appointed superintendent. Two years later, in 1902, the industry was moved to Atlantic Avenue, near the Exhibition grounds, and a thoroughly modern foundry building constructed. And now another change is being made, the old name being discarded owing to its similarity to many others, the distinctive name of Anthes Foundry, Limited, being substituted. Mr. Snider and his sons, will still maintain their financial interest in the company, devoting their time to the Waterloo Mfg. Co., Waterloo, Ont., and the active management of the foundry will continue, as before under the direction of H. W. and L. L. Anthes.

On approaching the plant one is naturally struck with its architectural features first. In the design and construction of the buildings care and consideration have been given to each detail which would tend to cut down unnecessary labor, and at the same time give a plant that was adequately protected from fire, well lighted, properly heated, and in every respect satisfactory.

The offices, pattern and machine shops occupy a rectangular building, 50 x 75 feet, at one corner of the plant. Beneath the offices there is a fire-proof pattern vault with concrete ceiling and self-closing fire doors. Under this part of the building are also the wash-rooms and the warehouse for snap-flasks, follow-boards, and similar equipment.

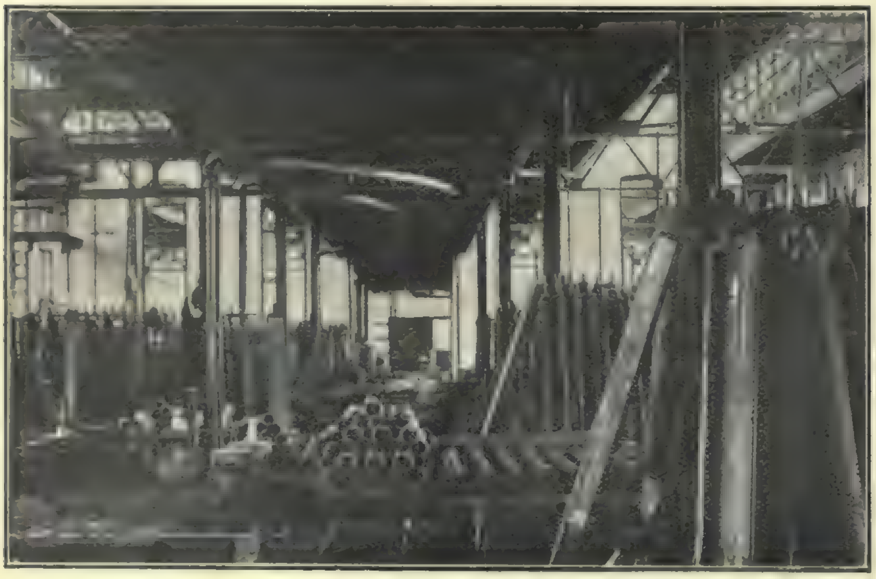


Fig. 1.—General View of Anthes, Limited, Pipe Foundry.

The foundry proper is divided into two parts, the entire foundry being 75 by 200 feet. Two-thirds of the floor is devoted to the manufacture of soil pipe, and one-third to the manufacture of fittings. For lighting the building side windows and a double monitor roof are used, the latter extending lengthwise over the foundry. Between the two monitor roofs there is a sunken gutter, which is very plainly shown in Fig. 1. Beneath this sunken gutter are supported the trolley tracks for carrying the iron in ladles to the fittings floor. The cupola is located midway of one end of the soil pipe shop and the overhead trolley system passes in front of it. The finished pipe is taken out on an industrial railway system.

The soil pipe manufactured varies from the heaviest to the lightest and from two to eight inches in diameter. Green-sand cores are employed in all of the work, both for fittings and for pipe. The flasks are all ground on the joint to insure accurate fitting. By traversing the flask back and forth under a revolving wheel, the joint is very quickly ground true and straight.

The molds are made on specially constructed molding machines. Patterns are arranged to strip down through the plate far enough to thoroughly release them from the mold. The cope and drag portions of the mold are exactly like each other except for the gates. The heavier sections are gated on each

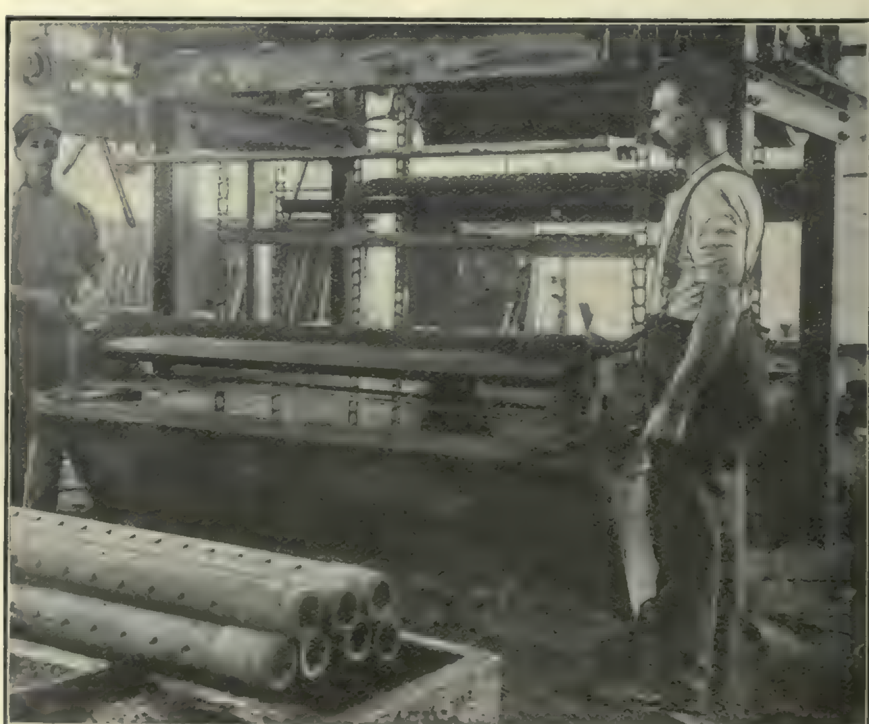


Fig. 2.—Side View of Green Sand Core-Making Machine.

end, while the lighter pipe is cast two pieces in a flask and gated on the sides.

Special Core Making Machine.

For making the cores for the pipe a special machine has been designed by L. L. Anthes and it turns out green-sand cores with remarkable accuracy and rapidity. One of the working sides of this machine is shown in Fig. 2. The machine is constructed double so that cores may be made on each side. The sand is elevated from the boot to sand hoppers above by long elevator buckets. In the bottom of the hopper there is arranged a bar, carrying teeth, which can be reciprocated by the eccentric shown just above the workman's head. When the mechanism is started, this bar with the teeth projecting from it causes the sand to flow in a steady shower and fall upon the cast-iron arbor. These arbors are first wetted and then rotated by a suitable crank, the arbor being supported in chilled bearings and the sand struck off to form the core by a straight-edge as shown. The sand in falling packs sufficiently so that the cores are made very quickly. As soon as the cores are made they are lifted out and placed on horses ready to be set in the molds as they are required. With the foundry running to its full capacity in turning out a carload of soil pipe a day it is necessary to operate both sides of the core machine, which keeps four men busy.

Fig. 3.—Molding Machine for Pipe, with Flask and Sand Hopper in Place.

The core sand is kept separate when the castings are shaken out and by mixing a little new sand with the old it is again used, the only sand ordinarily discarded being that which passes out with the work as it goes to the tumbling barrels.

Molding Machines.

The molding sand is used over and over, new sand being added to keep the pile up to strength. The molding machines are arranged to slide along the floor upon railroad iron guides which are permanently set into the floor each side of the sand heap, so that the workman is always near his work.

Fig. 3 shows one of the molding machines at the end of a row of completed molds. In the illustration a machine is shown with a cope flask in place and the sand hopper on top of it. A little facing sand is first riddled on top of the pattern and the hopper then shoveled full of heap sand. The molder first peens one side and then the other of the mold, after which he removes

Fig. 4.—Pattern for Pipe Fitting.

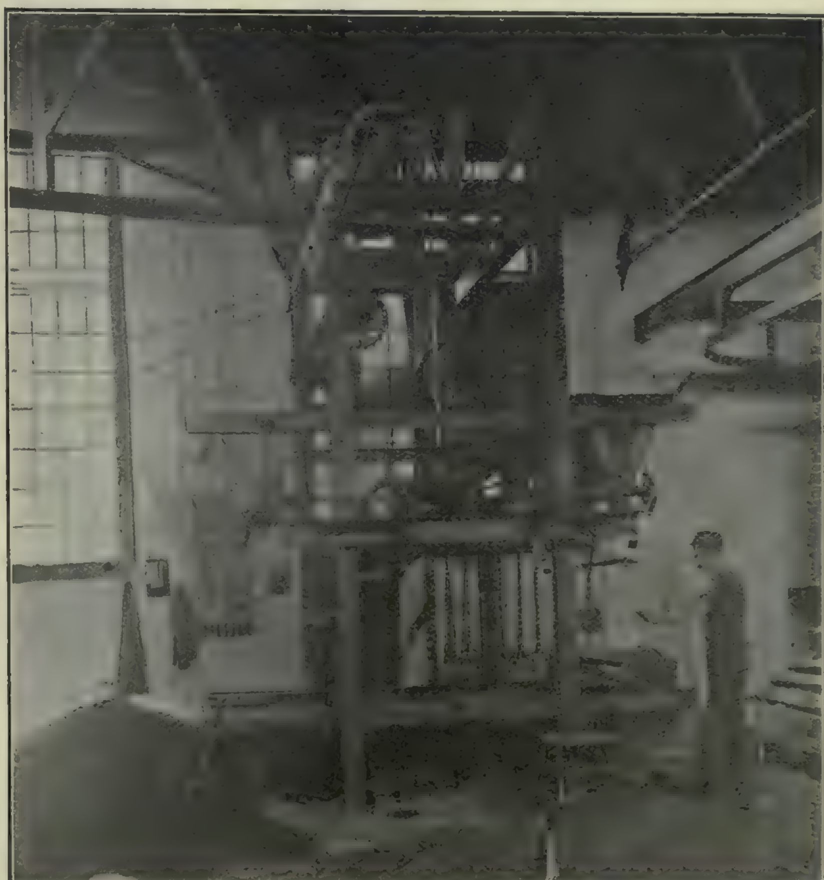


Fig. 5.—End View of Core Machine.

the hopper and buttrams the heap of sand left in the centre.

Making Fittings.

The fittings are all made with split shell patterns so arranged as to leave their own green-sand cores, as shown in Fig. 4. The patterns are in halves so as to form the green-sand core on the inside of the pattern and the mold on the outside. In the centre of the illustration referred to is seen a follow-board with the pattern and sprue in place. The cope and drag portions of the flask are held together by small wedge clamps slipped over chucks as shown. In the making of a 4-inch off-set the drag half of the pattern is laid in the follow-board and the core arbor are more durable, as they do no burn as do wooden ones, nor do they wear as rapidly. The iron flasks roll over better than wooden ones. They also take up less space in the flask storage, and the fire risk is eliminated.

For the medium-weight pipe two beads are used on the bell in place of one. The use of an extra bead around the base of the bell stiffens it and makes it better able to resist calking. The heavy fittings are made without the extra bead, as is the case with most fittings turned out in the United States.

Cleaning the Pipe.

The castings are tumbled in ordinary stave mills. Up to this point the prac- and the pipe and fittings are then dipped in this mixture and set up to drain. Within a few hours the linseed oil has dried down to form a hard but thin coating which is transparent, so that the pipe may be inspected just as well as though not coated. At the same time this coating prevents rust and also forms an excellent base for the application of paint.

Every foundry has to adapt its practice to existing conditions. In Canada the market is limited, hence there is not so great a demand for each separate size and weight of pipe and fittings as in the United States. For this reason it would not pay to fit up for the immense tonnage that could be dispos-

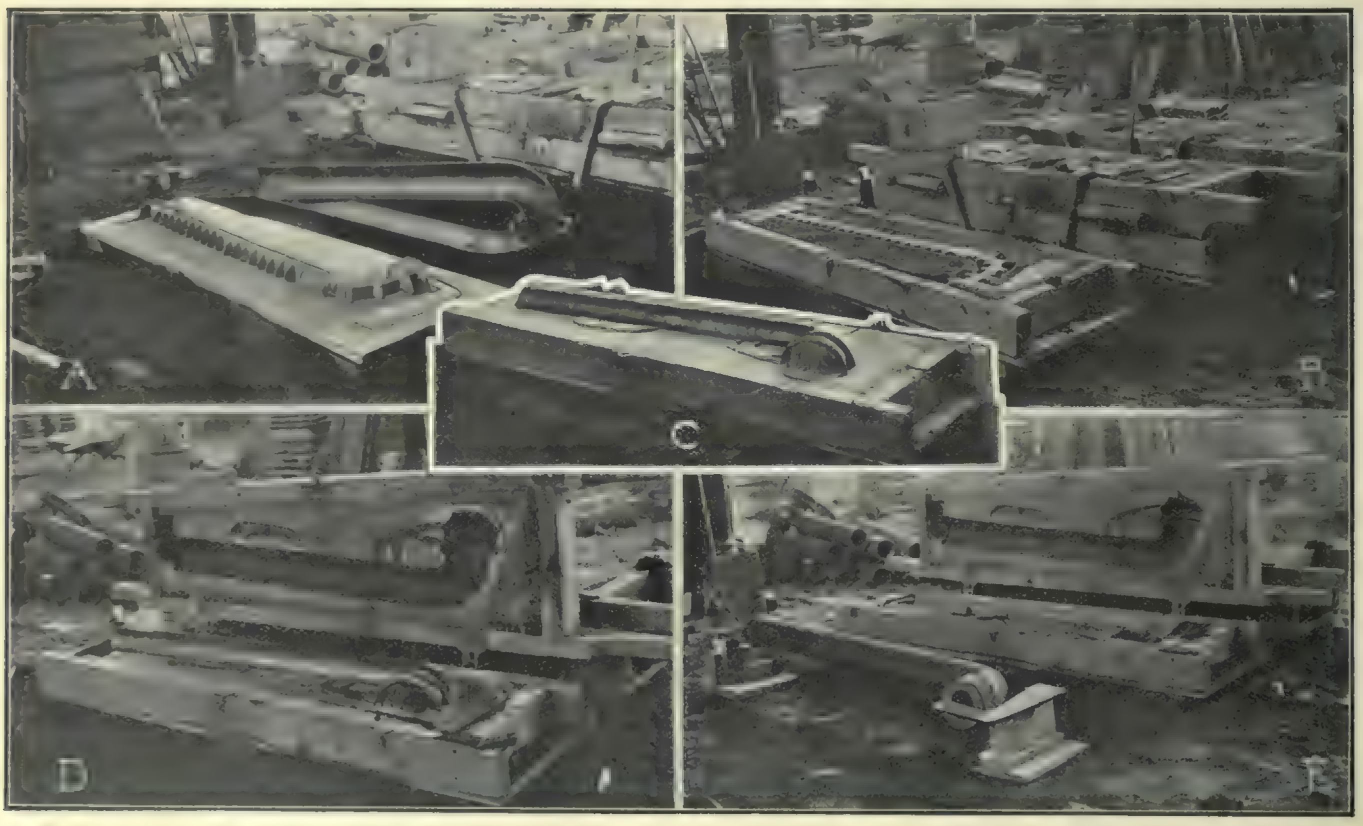


Fig. 6 A.—Core Arbor on Bottom-board and Pattern for a Quarter Bend 36 Inches Long Behind the Bottom-board. B.—Drab Rammed Up and Arbor in Place in Pattern Ready to Form Drag Half of Core. C.—Core Finished and Pattern in Place Ready to Ram Cope. D.—Mold Finished and Cope Rolled Back. E.—Core Lifted Out to be Finished and Mold Open.

or anchor placed in position as shown. These arbors are made in two or more pieces to suit the irregular form of the cores. The joints are dovetailed together, the parts being formed in chills so that they always fit accurately.

For all but the largest sizes of work, the foundry is equipped with carefully made iron flasks for use in connection with the manufacture of both pipe and fittings. The hinges used on all these flasks are so constructed that the cope may be rolled back and blocked in a vertical position. Some of the advantages of iron flasks are that they take up less space on the floor than wooden flasks and are less cumbersome. They

tice does not differ greatly from that found in many foundries in the United States, but the finishing of the pipes for the market is radically different. In the United States some of the pipe is dipped in a tar kettle, and in other cases it is marketed without any finish whatever; the reason for the latter practice being that the laws in many of the States demand that the pipe be left unpainted until after it has been installed, so that it may be thoroughly inspected. Where the pipes are left without tarring or coating they rust rapidly. The Canadian laws provide for the use of a coating of linseed oil. The linseed oil is thinned with benzine

ed of in the latter country. The heavy duty on soil pipe in each direction prevents the sale of Canadian pipe in the United States and of American pipe in Canada. However, Anthes Foundry, have a wide connection and some of the pipe is being shipped to the Pacific Coast.

The system of molding fittings used is especially adapted to the class of work being manufactured, and also to the relative number of pieces of each size which must be turned out. The entire work of the plant is on a piece-work basis and the greatest possible harmony exists throughout the entire organization.

INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News.

Foundry and Machine Shop.

An $11,000 Brick machine shop will be erected by the Ottawa Car Co.

The Pacific Creosoting Co., Seattle, will erect a plant on Burrard Inlet.

The Calgary warehouse of the Cockshutt Plow Company will be enlarged.

The Belleville G.T.R. shops were partly destroyed by fire last month.

The Robert Bell Engine & Thresher Co. will erect a warehouse at Moose Jaw.

P. Delorme's machine shop, at Sherbrooke, was badly damaged by fire on Nov. 7.

Concessions of land have been granted at Regina to the Regina Machine & Iron Works.

The Paymaster mine at Gold Rock, near Keewatin, Ont., are erecting a stamp mill.

It is probable that a fire clay plant will be established at Matsqui, B.C., in the near future.

The Bitulithic Contracting Co. have applied for a new site for their plant at St. Boniface.

Harvey Motors, Ltd., intend erecting a marine and stationary engine plant at Dundas, Ont.

Brantford has 5,000 men employed for the most part in implement factories and iron foundries.

Confirmation has been given to the report that the C.N.R. will erect new shops at Port Arthur.

A site has been secured at North Sydney for the smelter to be erected by J. H. Brown and his associates.

The National Iron Works, Toronto, are asking for a railway spur to their property in Ashbridge's marsh.

The Canadian Corrugated Pipe Co. has purchased several lots at Portage la Prairie and will erect a plant there.

The contract has been let to Wm. Kribs for the extension to the premises of the Hespeler Machinery Co., at Hespeler.

Clare Bros. & Co., Preston, have let the contract for an additional storey to be put on the present building used as the stove-mounting shop.

The Dominion Bridge Co., Lachine, have purchased property in Clarkstown, a suburb of Ottawa, for a storehouse for material and working plants.

The Stinson-Reeb Builders' Supply Co., Montreal, which deals in bricks, lime, etc., are said to contemplate manufacturing along this line at St. John.

The Allan Hills Edge Tool Co. have opened up operations at the old axe works in Galt, which had been closed for a year. In a short time 100 men will be employed.

The Malleable Iron Works at Amherst are again in operation, and are giving employment to forty men. It is possible that the staff may be increased in the near future.

A new steel manufacturing plant is to be established in Longue Pointe by the Montreal Steel Works, the property for the new establishment having been purchased in November.

The Maple Leaf Harvest Tool Co., Tillsonburg, Ont., have been making extensive additions and alterations to their plant and have succeeded in getting the new works in operation for the coming season's trade.

The Provincial Steel Plant at Cobourg has been rolling on an order for the Intercolonial Railway and as the order is a very large one it will keep the mill running several months.

The B.C. Electric railway has let the contract for the erection of its new car-barns and repair shops at New Westminster to W. W. Forrester. Work will be commenced immediately.

The Rock Island Tool Co. has been taken over by the Rock Island Mfg. Co. The business has been reorganized, and Harry Roper, of Montreal, has been appointed agent for the new company.

The Standard Foundry Co., Longueuil, Que., has been reorganized as the Standard Foundry & Machinery Co. E. Prevost is president of the new company, and S. Whiteside, is secretary-treasurer.

A syndicate of Watertown, N. Y., men have taken hold of the business of grinding the mica waste, or broken mica of the Canadian mines and have established a factory at Cape Vincent, N. Y.

The Canadian Bronze Powder Co.'s works at Valleyfield, Que., have an equipment for the manufacture of bronze and aluminum castings. The factory also affords accommodation for a jobbing iron foundry.

The Canadian Iron Furnace Co.'s works on the Ste. Maurice, at Three Rivers, have been partially burned out, the loss being about $50,000. The fire will probably throw some 200 men out of employment for some time.

A representative of the John Deere Mfg. Co., Illinois, manufacturers of agricultural implements and engines, was in Brantford recently, looking for a site for the establishment of a Canadian branch of the firm.

S. G. Kitchen, president of the Jackson Wagon Works, St. George, Ont., and president of the Brantford Cordage Co., Brantford, contemplates the establishment at Dort Arthur of a large wagon manufactory.

Fire completely gutted the large foundry owned by H. F. McCrae, at Tillsonburg, on Nov. 7. The loss will be $1,500, mostly on the machinery. Two valuable patterns were destroyed, but two large engines were taken out intact.

The International Gully Co., Montreal, has been changed to the Standard Foundry & Machine Co. to continue making on a larger scale the Colas gully. Alfred Colas, son of the inventor is vice-president of the new company.

The Dominion Wire Mfg. Co., Montreal, propose to establish at once a factory and warehouse at Vancouver, which will be ready in two months. For the immediate present, the operations of the company will be confined to wire nails.

Douglas Bros., Winnipeg, sheet metal workers, have purchased a location in Vancouver. This concern has been doing business in Winnipeg since 1872. An expenditure of $100,000 is contemplated, with employment of 100 hands at the outset.

Tenders were approved of for the erection of shops in the new corporation yard, Montreal. H. Lalonde, house and sheds, $9,300 ; Montreal Ship Lining Co., store and office, $24,400 ; and the Montreal Ship Lining Co., $28,780, for the shops.

Owen Sound parties who are forwarding the 500-foot dry dock scheme, have received assurance from Ottawa that there is a good chance for the usual 3 per cent. yearly bonus being granted by the government in favor of the enterprise.

Motors Ltd., is the name of a new company that will erect a large garage in Toronto where they will manufacture automobiles and cater to the Canadian trade. George Frost formerly of Smith's Falls will assist in the management of the new company.

An endeavor is being made to interest the Belfast shipping firm of Harland & Wolff in the recently established shipyard at North Vancouver, of McDougall, Jenkins, Ltd., since the Old Country firm has announced its intention of starting in Canada.

The Valleyfield Mfg Co. have erected a large concrete building alongside the G.T.R. track, at Valleyfield, Que., and are now manufacturing stoves and ranges, and intend to manufacture iron beds. Mr. Howard, formerly of Morrisburg, is the manager.

Edward Gurney, president, and E. Holt Gurney, sales manager of the Gurney Foundry Co., Toronto, made a trip to the Pacific coast, to look over the western field with a view to the establishment of a branch foundry at Vancouver or New Westminster.

The Collins Mfg. Co., Toronto, have erected a new factory. New machinery has been installed and several new hardware specialties will be put on the market soon, at present their energies being directed chiefly to sprayers, gas stoves, steam cookers, asbestos thimbles, etc.

A wire factory will probably be established in New Westminster in the near future, by Thomas F. Black, of the Black Hardware Co., Winnipeg, who has been conferring with the city council and board of trade there on the matter of securing a suitable site for the proposed plant.

The Smith's Falls Malleable Castings Co. have reopened the new shops in the north end of Smith's Falls and both plants will be kept busy supplying malleable castings. E. J. Curran, Chicago, has been engaged as superintendent of the new shops and J. T. Cauley, Marion, Ind., assistant-supt.

The resumption of mining in Eastern Ontario, may mean a smelter in Kingston, a new industry, if the city council and citizens will encourage it, but unless encouragement is given in the way of municipal site and exemption, it is within reason that the smelter will be put up at the mines.

A company capitalized at $250,000 has been formed, under the name of the St. Lawrence Car Works Co., to carry on a railway car building industry at Levis. The new company proposes to establish works capable of turning out 600 cars a year on the average, representing a value of $600,000 at least, and to spend over $60,000 a year in salaries.

Robert J. Riddell, Chatham, who has since the death, some years ago, of his father, the late Robert Riddell, carried on the business of machinists under the firm name of R. Riddell & Son, has made an assignment. December 6 has been fixed as the date after which a distribution of the assets will take place. The firm has done a considerable business in fire escapes, also handling bicycle repairs.

The Western Steel Corporation, recently incorporated with a capitalization of $20,000,000, has opened offices at Vancouver. In this company are interested a number of large and successful business men on the coast, and the scheme is

to have a manufacturing site somewhere in British Columbia. An announcement is made that they are the buyers of a Fraser river waterfront, valued at $300,000.

The James Stewart Mfg. Co., Woodstock, were unfortunate enough to lose their warehouse and entire stock in Winnipeg by fire on Saturday, Oct. 30, but fortunately their insurance will fully cover the loss. Cars which they had on the way at the time of the fire have since arrived and further ones are now on the way. Temporary quarters have been secured, and they are conducting business as usual.

At a recent meeting held in Wingham, Ont., directors of the Western Foundry Co. were elected as follows: T. A. Mills, J. J. Cunningham, R. Vanstone, J. A. McLean and W. D. Varey. Mr. Mills was elected as president and the stock held by Dr. Allen, of Toronto, was transferred to Mr. Mills and other Winghamites. The Western Foundry Co. is considering the enlargement of the plant.

The Regal Automobile Co., of Detroit, proposes to establish its Canadian branch at Windsor, and a new company is being organized, including E. N. Richards, of Windsor, who is to be manager. To supply the Canadian trade the company proposes to establish a $100,000 plant, with a capacity of five cars a day. Negotiations for a suitable site are being made and it is expected building will begin shortly.

The Ross Sleeping Car Co. are looking about Vancouver with a view to the establishment of a large car building plant there. The concern has recently been organized with large capital to put put on the market a sleeping car of steel construction, which has many improvements over the cars now ordinarily used, these being covered by patents in the United States and Canada. The company expects to employ 500 men.

T. McAvity & Sons, who have been in business in St. John, N.B., for a century associated with the McLean, Holt Co., intend establishing a foundry in Fort William, providing satisfactory terms can be arranged with the city. J. L. McAvity, who is interested in both concerns visited Fort William spending several days in conference with Herbert W. Baker, Industrial Commissioner, Mayor Peltier and other civic officials.

A syndicate of Canadian business men, headed by a group of prominent Halifax gentlemen, and backed by the big shipbuilding firm of Swan, Hunter & Wigham Richardson, Wallsend-on-Tyne, England, will apply for a charter of incorporation for a company, to be capitalized at $10,000,000, for the purpose of erecting large shipbuilding docks at Halifax and Dartmouth, and is said to have purchased land for that purpose.

The Hamilton Steel and Iron Co. state that Montreal and Toronto capitalists have bought large blocks of stock, and that E. B. Osler and W. D. Matthews have been added to the board of directors. The rumor that the C.P.R. has control of the stock is denied absolutely. A new bolt and bar mill will be built, and the company will do business on a much larger scale, entailing an expenditure for new works of over a million dollars.

It is stated on reliable authority that among those interested in the new lease of the government dry dock at Kingston, is the Collingwood Shipbuilding Co., and that when the lease is finally accepted by the government, as there seems to be no doubt it will be, it will mean the establishment of a very large repair plant in connection with the dry dock. The drydock was leased by W. J. Fair, who is interested in the erection of a modern repair plant.

The Frost & Wood Co., Smith's Falls, and Cockshutt Plow Co., Brantford, have cemented their interests in the west and in future the latter company will handle the output of the Frost & Wood Co. in Western Canada. The Cockshutt Plow Co. are making an addition 100 x 50 ft. to their plant. Frost & Wood Co. have over 500 men at work. H. Cockshutt has been elected vice-president of the Frost & Wood Co. to fill the place of the late C. B. Frost. Hon. Francis T. Frost is president.

Work on the construction of the new plant of the Standard Sanitary Mfg. Co., on Royce Avenue, Toronto, has been begun. The foundations of four buildings have been excavated and the work of erection will continue all winter, all the buildings being steel frame with reinforced concrete fireproof construction. There are to be six buildings in all, an enameling building, 60 x 150 feet; a 3-storey mill building, 65 x 50 feet, for making enamel; a 6-storey warehouse, 65 x 200 feet; a 4-storey pattern building, 65 x 130 feet, and a foundry and a cleaning house for castings, the dimensions of which have not been decided. Frank Painter, superintendent of the plant, has removed from Pittsburg to Toronto and will supervise the work of construction and instalation of machinery.

Negotiations have been concluded for the location at Welland of a large steel plant, where smelting will be done by electricity. This company will be known as the Electric Steel Co., of Canada, with head office in Toronto and branch office in Buffalo. The men behind the industry have large interests in steel and iron in the Pittsburg section. They are: President, Tyson S. Dynes, St. Louis, Mo.; vice-president, George G. Goodrich, Saratoga, N.Y.; secretary, A. S. Ramage. Work on the initial building, the billet mill, will begin in a few days. One thousand horse-power for the operation of the mill have been contracted for with the Falls Power Co. The daily output will be 1,000 tons, which will require 2,000 tons of ore daily or a shipload a day. Five vessels are already under contract to deliver ores before the close of navigation, for it is anticipated that the mill will be ready for testing before the opening of navigation next season. It is intended to erect next year other mills for the making of finished products in iron and steel.

The shipbuilding yards and boiler-making works now in course of construction by McDougall & Jenkins, Vancouver, are being rushed. This company has acquired 200 feet of water-frontage on Burrard inlet with a depth of 300 feet and a ground area of 60,000 square feet. Work is now proceeding on the erection of buildings and the preparation of the ground and some of the plant has already arrived, including an electric crane with a lifting capacity of 40,000 pounds. The boiler shop, machine shop, foundry and blacksmith shop will all be equipped with modern plant and this branch of the business occupies a prominent place in the plans of the company. The shipbuilding department is something in which great interest is being shown for developments are expected which will mean great things to the port of Vancouver. The yards will go in for steel shipbuilding, and already plans are out for two steel freight steamers to be constructed there.

Municipal Enterprises.

Penticton, B.C., proposes to establish a waterworks system next summer.

Plans are being prepared for the Montreal high pressure water system.

The waterworks by-law for $400,000 has been passed by Vancouver ratepayers.

Coldwater, Ont., is considering the advisability of instaling a system of waterworks.

Victoria council will be in the market shortly for an up-to-date street flushing machine.

The contract for Elizabeth Street sewer, at Barrie, was let to T. E. McMurray, for $2,125.

The Portage la Prairie, Man., waterworks by-law has been passed. Estimated expenditure, $20,000.

The installation of New Liskeard's waterworks connections is held up by the lack of the necessary fittings.

Wingham ratepayers will in January vote on a by-law to construct a waterworks system and a main sewer.

Victoria is making surveys relative to undertaking the construction of a waterworks system from Sooke Lake.

Waterworks and electric light extensions, estimated cost $2,600, have been sanctioned by the Port Colborne council.

Tenders are being called for waterworks construction, including piping and valves for wood pipe for South Vancouver.

A by-law will be submitted to the Havelock ratepayers in January next to raise $4,000 for a permanent drainage system.

Cleveland & Ducher, engineers, have prepared plans for supplying several adjoining Vancouver municipalities with water. Initial cost, $500,000.

A by-law has been adopted by Longue Pointe to borrow $150,000 to construct a water system, the water to be supplied by the Montreal Water & Power Co.

Lachine P. Q., has closed a contract with John McDougall & Co., Caledonian Iron Works, Montreal, for the purchase of a new pump for the aqueduct.

The Victoria city council is calling for tenders for ornamental steel pillars for carrying arc lights. The lights are to go along the causeway in front of the Empress Hotel.

The Ontario Railway and Municipal Board have approved by-laws under which Cobalt township is to spend $75,000, and the town of Cobalt $25,000 upon a water works system.

By installing a gravity system, which will do away entirely with maintenance and operating expenses, Hamilton hopes to save about $25,000 a year on the new west end sewage disposal plant, which will be built next year. The system will be the first of its kind in this country, although there is one in use in Germany.

Weston town council awarded contracts last month for the new waterworks system. The successful tenderers are: Contract "C 1," steel water tower, Toronto Iron Works, $5,040; Contract "D," all cast iron water pipes and special castings, Canada Foundry Co.; Contract "E," fire hydrants, sprinkling cranes, gate valves, and valve boxes, The London Foundry Co. The total cost of the work will not be less than $55,000.

Railway Construction.

The C.N.R. and Hill lines are building roads to Lethbridge.

The proposed underground railway at Toronto is estimated to cost $1,000,000 a mile.

J. Stewart Clark is promoting an electric railway between Port Dover and Berlin.

It is rumored that the Grand Valley Railway Co., will extend their system to London next year.

It has been definitely announced that the C.N.R. will enter Hamilton. A route has been decided on.

A party of engineers has started from Pas Mission to locate the Hudson's Bay line from there to the bay.

The Calgary street railway management find it necessary to extend the present system, and will spend $40,000.

The C.N.R. will be into Kamloops within two years' time and will go down the Thompson and Fraser rivers to the coast.

Mackenzie & Mann interests have acquired railway construction near Portland Canal, B.C., and will build 20 miles of road there next year.

It is expected that track-laying on the Ontario West Shore Electric Railway, between Goderich and Kincardine, will commence in a few days.

The Chicoutimi Pulp Co. has awarded contracts for the construction of an electric railway from its mills to the limits in the Riviere du Moulin district.

The G.T.P. has awarded to Foley, Welch & Stewart, the contract for constructing a 140 mile section of main line from Kitsilas Canyon to Aldermere, B.C.

The Winnipeg Street Ry. has been notified by the city council that, owing to the increase of the population in the northwestern part of the city, it must extend its system.

The Public Works Department, pending the completion of the Quebec bridge, have in view the construction of railway terminals for the Delaware & Hudson Railway at Levis.

The contract for the building of the spur line on the T. & N. O. Railway, connecting with the main line at New Liskeard, has been awarded to Canadian Contracts, Ltd., Toronto. The work will be proceeded with at once.

The purchasers of the London and Port Stanley electric railway propose extending the line east through Ingersoll, Woodstock and Paris, to Brantford; west from London to Strathroy and Glencoe, and from St. Thomas to Aylmer.

The plans of the Montreal and Southern Counties Electric Railway comprise, besides the St. Lambert line, three extensions, viz., from St. Lambert to Chambly, a second to Longueuil, and a third to Laprairie and the up-river parishes.

Progress is being made by the survey party making preliminary locations for the line for the Victoria and Barclay Sound Ry. The party has reached Boulder Point, 40 miles from Victoria, and are rapidly approaching San Juan, the objective point for this season's operations.

The contract for the construction of the uncompleted portion of the Alberni branch of the Esquimalt & Nanaimo railway, a section of about 27 miles, at the western end of the road, has been awarded to Janse, McDonell & Timothy, Calgary. Construction will commence immediately.

A sub-contract has been let by the C.N.R. to Dibona & Orlando Bros. for the construction of the section between Trenton and Brighton, and they have brought their plant from Quebec to start work at once. They will begin at the Trenton end. A steel bridge with a swing span will be erected across the Trent river.

Under the name of the Pine Pass Railway, a company is seeking incorporation to build a railway from Edmonton through the northern wilds to Fort McGeorge, a Hudson's Bay post. The company is reported to have strong backing, financially, and as soon as the charter has been obtained construction will be commenced.

Shut out of the Fraser river canyon owing to the prior location of the C.N.R., it is stated that the Grand Trunk Pacific has decided to seek another route for that portion of its proposed branch line between Kamloops and Vancouver. Its engineers have completed the survey of the line all the way from Yellowhead Pass via Cranberry lake and thence down the North Thompson to Kamloops.

Structural Steel.

The Department of Public Works, Ottawa, has called for tenders for the removal of the wreckage of the Quebec bridge.

The Hamilton Bridge Co. was awarded the contract for the erection of a new steel bridge at Kelvin, near Brantford.

The Langevin bridge by-law, for a 30-foot bridge over the Bow river at Calgary, has been sanctioned by the ratepayers.

A by-law will be voted on at Toronto next January to raise $769,000 to build a viaduct across the Don valley at Bloor street.

Tenders will be asked for early next spring, for the erection of a new steel bridge on Market Street, Brantford, over the canal.

Brandon's city engineer, R. E. Speakman has submitted estimates of the cost of a subway under the G.N. and C.P. Railway tracks, also of a bridge over the same. Estimated cost of former $120,000, and of latter $105,000.

At a recent meeting of the Sherbrooke city council, the road department recommended that the tender of Mackinnon & Holmes, for the construction of the new bridge over the Magog river be accepted, it being the lowest tender.

The B.C. provincial government will immediately commence the construction of a bridge over the Slocan river at Slocan Junction. The bridge will be 213 feet in length and will cost $10,000. The contracts for the iron works has been let to the Nelson iron works.

The Municipal Council of the Township of East Farnham, Que., has decided to build a new iron bridge across the river at Brigham. They have received aid from the government for the construction of this bridge. Tenders have been called for and the plans and specifications are ready.

Electrical Notes.

Stratford has purchased the electric light plant from the Stratford Gas Co.

An option has been secured on a water power north of the town by the Lindsay council.

The B.-C. Electric Railway Co. has completed the lighting and power services at Port Moody.

Saskatoon ratepayers endorsed a plan to purchase the Saskatchewan Power Co.'s charter for $1,000.

The Shediac river is being dammed to generate power for electricity to light the town of Shediac, N.B.

Machinery is being installed for the electric lighting service at Carmangay, a three months old town in Alberta.

A by-law to appropriate $16,000 for the construction of an electric light plant has been passed at Nanton, Alta.

The General Electric Co., Schenectady, N.Y., has reopened its mica works at Carleton Place and will employ 150 hands.

The controllers decided to buy a site at the corner of Duncan and Nelson Streets, Toronto, for an electrical substation.

The C.P.R. management is investigating the feasibility of electrifying its branch line between Phoenix and Granby smelter.

F. P. Charlebois, Toronto, having secured the water rights in Silver Creek, has made an offer of cheap electric power to Collingwood.

The contract for the installation of government telephone exchanges at Hanley and Melville, has been awarded to Simpson & Craig, Virden, Man.

The corporation of Ingersoll will not enter into arbitration proceedings with the Ingersoll Electric Light and Power Co. for the purchase of their plant.

The Raymond Mfg. Co., Guelph, a large concern in the manufacture of sewing machines, etc., have added a new department for the making of electrical supplies.

The contract for about 8,000 pounds of wire for the balance of this year's electric light work at Calgary, has been awarded to the Canadian General Electric Co.

The Kamanistiquia Power Co., of which Sir Edward Clouston, H. S. Holt, C. R. Hosmer, F. W. Thompson, and J. E. Aldred, of Montreal, are directors, has just been granted a ten year franchise by Port Arthur.

The document approving of the undertaking of the Vancouver Island Power Co., at Jordan River by which power will be supplied to the B.C. Electric Co., has been published.

Three car-loads of electrical machinery arrived for the Fort Frances Canadian power house from Hamilton, and is now being transferred to the power house to be placed in position.

Eastview, Ont., village council has received an offer of electricity at $15 per horse power for lighting its streets and houses. The village will probably establish a municipal plant.

At a meeting of the Montreal Fire and Light Committee a resolution calling for the immediate purchase of some 200 electric lamps of the style at present in use in the city streets was adopted.

At a general meeting of the Berlin Board of Trade the railway committee was instructed to enter into negotiations with the G.T.R. regarding the electrifying of the Galt and Elmira branches.

The St. John Railway Co. is remodelling its office building on Union Street and will convert the entire ground floor into a showroom for electric light and gas fixtures and gas stoves and accessories.

Cornwall is to have a big power company, if Parliament, at its next session, incorporates the St. Lawrence Power Transmission Co., with a capital stock of $250,000, which is applying for a Dominion charter.

Brockville's civic light and power department closed a successful year on September 30. The plant was purchased nine years ago, and since then gas and electric light have been reduced from $2 to $1.12½ net per 1,000.

The M.C.R. is arranging to substitute electricity for steam on its St. Thomas yard engines. Electric locomotives for switching purposes will be one of the improvements to come with the opening of the tunnel at the Detroit river.

W. Hibbard, representing Montreal capitalists is trying to secure the Sherbrooke Street Railway, with a view to securing a water power which that city now controls. If power can be had the system will be extended in the city by about eight miles.

The Ontario Power Co. is negotiating with the Central Methodist Church, at Welland, for the privilege of erecting a transformer station on the rear of the church property, the church to receive free electric lights and power for organ in return for same.

Hamilton is organizing a movement to have the Dominion Government build the new Welland Canal on the old Grand River-Hamilton Canal survey, securing thereby the cheapest power on the continent, besides bringing enlarged navigation to its doors.

In regard to the application of the Metropolitan Electrical Co. for concessions and an extension of their franchise at Ottawa, it was the general opinion that the city plant should be extended, rather than have an opposing company come into the city and compete with it.

Trenton, Ont., ratepayers on Nov. 15 defeated the proposition to ratify the agreement made with the Trenton Electric and Water Co., for the operation of a dam on the Trent Canal, the surplus water of which has been acquired by the town. This means that the town will operate a municipal plant.

A syndicate backed by London and New York capital is to undertake a huge enterprise at Prince Rupert involving an expenditure of $5,000,000 in providing street car and lighting systems, the erection of a smelter for the treatment of the ores of the mining districts of the north, and kindred industries.

The Westinghouse Co. is installing some electrical machinery at Powassan, Ont. The ma-

chinery is going in from Calander for the Nipissing Power Co., who are generating power on the South River for North Bay and surrounding country. The company have about two-hundred and fifty men at work on the dam.

The Shawinigan Electric Co.'s electric power line from Asbestos to Windsor Mills, a continuation of the line from Shawinigan to Asbestos, has been completed. The wires are now carrying 50,000 volts of electricity to furnish power for the Canada Paper Mills. A telephone line is to be built in connection with the same in the near future.

The tender of the Canadian Westinghouse Co., Hamilton for the electric motors for the electric pumps to be installed at the main pumping station and high-level pumping station at Toronto has been accepted by the Board of Control. The successful tender was for $107,765. The next lowest tender was from a Glasgow firm, $120,000.

Contracts for the additional electrical power development works at Wilson's Falls, Bracebridge, Ont., have been awarded to Canadian Contracts, Ltd., Toronto, dam, intake and power-house foundations. William Kennedy & Sons, Owen Sound, received the contract for the water-wheels, and the Canadian General Electric Co. the contract for the electrical machinery.

St. Lambert, Que., has decided to install an electric water pump to do away with the present steam pump, and to erect poles, wires, and apparatus for the electric lighting of the town the current to be supplied by the L. E. Waterman fountain pen factory. A loan of $7,000 has been passed for the purpose. The action of the council is to pave the way for the town to own a complete power plant of its own.

A special committee dealing with the standardization of equipment reported to a recent meeting of engineers, representing the 12 municipalities in the Niagara Power Union, in favor of the adoption of a luminous arc lamp in business districts and a similar type of Tungsten incandescent lamp for use in the residential districts, the latter to be placed from 125 to 150 feet apart, to overcome any interference of trees.

The by-law raising money for installation of electric pumping plant at Welland has been approved of by the Lieutenant-Governor in council and also by the municipal and railway board. The council has advertised for tenders for pump and electric motor, and the contract has been signed by the Ontario Power Co. and the council for street lighting and operation and maintenance of pumping plant. The contract is for a term of five years for the sum of $1,500 per year.

The St. Lawrence Power Co. and the Long Sault Development Co. (the U. S. and Canadian companies which propose damming the St. Lawrence river for power purposes) are seeking power to amalgamate, and have presented to the Dominion Government new plans which will meet the objections to the scheme by improving navigation at the point of development. Government engineers will consider the proposition. Cornwall town council hgs officially endorsed the scheme.

Hamilton having decided some weeks ago to take 1,000 h.p. from the Hydro-Electric Commission, the city council now is asking the Commission for further concessions in the shape of underground wires. This the Commission refuses to do, and as the matter now stands Hamilton has the alternative of complying with the terms submitted by the Hydro-Electric Power Commission and approved by the ratepayers or remain permanently beyond the pale of the government power project.

Contracts have been awarded by the Hydro-Electric Commission in connection with the transmission lines, transformer stations and all mechanical equipment as follows: To Royce, Ltd., of Manchester, England, for electric cranes for the transformer stations at Niagara Falls and Dundas; for electric cranes for the transformer stations at Toronto, London, Guelph, Preston, Berlin, Stratford, St. Mary's Woodstock and St. Thomas, to Mussens, Ltd., of Montreal and Walkerville. Total amount of bids, $17,094.

The Port Arthur power propositions have been causing some excitement in that city. First the Ontario and Michigan Power Co. offered prices more advantageous than the Power Commission. For 3,000 h.p. the price was to be $18; for 4,000, $17; and for 5,000, $15. The Commission's prices submitted were $19, $18 and $17.60 for the same amounts. On a vote by the ratepayers on Nov. 4, the Hydro-Electric Commission's contract was endorsed. James Conmee, M. P., representing the O. & M. Co., applied for an injunction on the ground that the ratepayers had not been afforded opportunity to intelligently vote on the proposition. Justice Clute, sitting at Toronto, granted the injunction.

Planing Mill News.

A new lumber mill will be erected at Nahima, on the Alberni Canal, B.C.

Mr. Quance, of Jaffray, B.C., intends to locate a saw mill at Nakusp, B.C.

The Rainy Lake Lumber Co. will build a large saw mill at Fort Frances next summer.

The Matthews & Smith Lumber Co., are transferring their lumber mill to Oak Point, Man.

The Ratz saw mill at St. Clemens, Ont., was completely wrecked last month by a boiler explosion.

The Quebec and St. Maurice Industrial Co. has started work on the erection of a pulp mill at La Tuque.

The sawmill operated by Hamilton Bros., at Glenhuron, Ont., was destroyed by fire last month. Loss $3,500.

The Goderich Lumber Co. has disposed of its plant at the harbor to J. E. Baechler, who has been running a mill at Camlachie.

The Gage-Harrison saw mills, at Burke's Falls, Ont., owned by J. W. Gage, Hamilton, were destroyed by fire last month. Estimated loss $12,000.

E. W. Backus, president of the power company at Fort Frances, is contemplating erecting a paper mill in Fort Frances in the near future.

The Big Bend Lumber Co.'s mill, at Arrowhead, B.C., was destroyed by fire in November. Some of the capitalists and investors interested belong to Kingston, Ont.

Fire destroyed the mill of the Brackman & Ker Milling Co., at Victoria last month, the loss being about $30,000. Immediate work will be started on the new building, which will be entirely of brick.

Hiland & Sullivan, shingle manufacturers, Surrey, B.C., have bought for $50,000, some property at New Westminster on which they will build a four storey structure early next year at a cost of $20,000.

P. J. Noel, of Merrill, Wis., is looking over the ground at Fort Frances with a view of establishing a manufacturing industry for manufactured articles in woodenware, furniture, excelsior and other commodities.

The Canada Woodenware Co., whose plant at Ossekeag, King's county, N.B., was burned in June, 1907, is being reorganized, and sufficient capital is being secured to build an up-to-date plant at South Bay, St. John county.

The sawmill of the Glen Lumber Co., at Rutherglen, near North Bay, was burned to the ground, together with a small quantity of timber. The mill was insured for $5,000, which will about cover the loss. The lumber was fully insured.

Trade Notes.

The Brantford Emery Wheel Co. has moved into its new and more commodious factory on Pearl Street, Brantford.

D. Freeland, of James Eadie & Sons, Clydesdale Tube Works, Rutherglen, near Glasgow, has been on a visit to Montreal.

Thos. G. Forsyth, of Berlin, and Alfred Vice, of Elmira, have purchased a controlling interest in the Elmira Agricultural Works, from Mr. Laschinger.

James Brennan, foreman of the plow department of the Percival Plow and Stove Co., Merrickville, has just completed fifty years' active service for that company.

The Dominion Foundry Supply Co. shipped a No. 7 Whiting Cupola to the Amherst Foundry Co. This is only one of several that have been shipped in the last month.

Lee G. Smith has resigned as superintendent of the Bucyrus Steel Casting Co., Bucyrus, O., to accept a similar position with the Londonderry Steel Foundry, Londonderry, N. S.

Willis Mitchell, of James Courtland & Sons, Birmingham, Eng., has been making a trip through Canada from coast to coast. He reported business as being exceedingly good.

F. P. Jones' resignation from the Dominion Iron & Steel Company will take place on January 1, when he will assume the management of the Canada Cement Company, at $25,000 a year.

R. W. Robb has been appointed manager of the Montreal office of the Robb Engineering Co., Amherst. Mr. Robb is a practical engineer, having had experience at the works, as well as erecting and operating the firm's engines in various parts of Canada.

Ridout & Maybee, Patent Solicitors, Toronto, after occupying offices at 103 Bay St., for 16 years past, are now removing to more convenient premises in Manning Chambers, at the west side of the City Hall, Queen St. West, where they will be able to receive their clients on and after Dec. 1st.

Smith, Kerry & Chace, consulting engineers, Toronto, have opened an office at Revelstoke, B.C., which will be the head office for western Canada. The work they have on hand in the west includes an expenditure of $15,000,000. This sum includes a power plant in Portland, Oregon, and one in Idaho, U. S.

Barkey Bros., Stouffville, manufacturers of Standard Crown valves, have moved into a more commodious factory. The new plant is a two-storey well lighted, brick building 50 x 80 ft. The equipment includes several special grinding and boring machines in connection with the manufacture of valves.

The Brantford friends of Harvey Cockshutt tendered a farewell dinner in his honor at the Brantford Club some days ago. Mr. Cockshutt leaves shortly for Winnipeg, where he will be connected with the west end of the business of the Cockshutt Plow Co., on account of the recent development of the Co.'s business in the west.

The travelers of the Cockshutt Plow Co., Brantford, 25 in number, held their annual reunion and banquet on Nov. 8. The event was held at the Belmont hotel, there. Trade matters were talked over at the gathering, George McFarland was chairman and Harvey Cockshutt vice-chairman. Speeches were delivered by the visiting travelers and R. D. Cockshutt.

A. F. Townsend, manager of the Cape Breton Electric Co. is being transferred by Stone & Webster to one of the company's large New

England concerns the move being an advancement for Mr. Townsend. H. C. Foss, manager of the Sydney and Glace Bay Railway, will assume the joint management of both companies.

The office and sales staff of the Pease Foundry Co., Toronto, gave a complimentary dinner a few nights ago in the St. Charles cafe to T. B. Medforth, who has been their accountant for a number of years, and who has accepted a position with a trust company in Vancouver. A pleasant feature of the evening was the presentation to Mr. Medforth of a case of pipes.

Charles Potter, 85 Yonge St., Toronto, under the management of Mr. Petrie is installing an oxy-acetylene apparatus and will carry on a general repairing business. The system they intend using is that of the Linde Air Products Co., Buffalo. H. G. Orde spent some time in the Buffalo works acquainting himself with the system.

Southams, Ltd., manufacturers of tickets, tags, labels and specialties, Montreal, have added a new department to their business, a folding box department which includes a full assortment of machinery for the manufacture of folding boxes or cartons, candy boxes, raisin boxes, jelly powder boxes, millinery and whitewear boxes, etc. They handle specialties of all kinds.

Harry D. Bayne, for many years manager of the Canadian Westinghouse, at Montreal, has acquired an interest in the Canadian end of the General Electric Co., of Sweden, which has been doing business in a limited way in the Dominion for some time, but an application will be made to Parliament for incorporation in Canada. Mr. Bayne will continue to make his headquarters in Montreal.

At a recent meeting of the board of directors of the Canadian Light and Power Co., St. Timothee, Que., it was decided to increase the number of directors from seven to nine, and Nathaniel Curry, president of the Rhodes-Curry Company, president and general manager of the Canadian Car and Foundry Co., and J. M. Wilson, president of the Boivin-Wilson Company, were elected.

Edward Gurney and E. Holt Gurney, president and sales manager of the Gurney Foundry Co., Toronto, have returned from a month's trip to the Pacific coast. They report a good normal trade being done, with no prospective shortages in stocks of heating apparatus. The announcement of the proposed establishment of a branch foundry at New Westminster they characterize as premature.

Francis Hyde & Co., report a very busy month and have shipped some very nice orders of their furnaces including :—7 rivet furnaces to the Canada Foundry Co. (bridge dept.), 3 furnaces to the American-Abel Thresher Co., and a complete installation of 8 furnaces for general use to Moody & Sons. They have on order 3 furnaces for the T. & N. O. Ry. and the Cockshutt Plow Co., have one on test now.

The Canadian Sales Co., St. James St., Montreal, of which J. Sophus is manager, has been joined by John Drewson, Montreal, and J. E. Johnston, accountant. A factory equipped with the proper machinery has been established on St. Paul St., where a number of specialties will be manufactured. F. S. Downham has charge of this end of the business. There are also the electrical and import departments. The electrical department comprises the cleaning oiling, and general maintenance of electrical motors under contract for various terms, this contract, including a weekly or fortnightly inspection. This is an entirely novel idea, and is being well received. This department is under the charge of W. E. Bullen.

Smart-Turner Machine Co., Hamilton, have recently installed pumps of various designs in the following plants, Northern Crown Bank, Toronto ; H. Frechette, M.D., St. Stanislas de Champlain, P.Q. ; Thos. Lannen, Port Colborne ; Ferranti Ltd., Toronto ; P.E.I. Ry., Charlottetown ; Clark Blanket Co., Bullocks Corners, Ont. ; Rio Motor Co., St. Catharines ; Aberdeen Elevator Co., Tiffin ; Ontario Iron & Steel Co., Welland ; Kirkfield Portland Cement Co., Coboconk ; Buffalo Mines, Cobalt ; Canadian Westinghouse Co., Hamilton ; Fowlers Canadian Co., Hamilton ; Adams Wagon Co., Brantford ; T. & N. O. Ry., North Bay ; Burlington Canning Co., Burlington ; Groble & Wandry, Mimico ; Henry Disston Saw Co., Toronto ; Hanover Specialty Co., Toronto ; Hamilton Bridge Wks., Hamilton; Harris Abattoir Co., Toronto ; Aluminum Stopper Co., Toronto ; and N. B. Pulp & Paper Co., Millerton.

Building Operations.

Two new elevators will be erected at Port Arthur next year.

The C.P.R. will build a new freight shed at Claresholm, Alta.

The C.N.R. will build a large modern roundhouse at Port Arthur.

The Quebec Harbor Commissioners will rebuild the Quebec freight sheds.

The Western Motor Co. will erect a large modern garage at Victoria.

The McLaughlin Carriage Co. is erecting a $25,000 warehouse at Calgary.

A C.N.R. and G.T.R. union station is proposed to be built at Cobourg.

The National Elevator Co. will erect a new cleaning house at Port Arthur.

A match factory will be built at Alexandria, Ont. W. A. Catton is interested.

A $10,000 wing is proposed to be added to Royal Victoria Hospital, Barrie.

The Wetaskiwin Mattress Co. is to have a warehouse erected at Camrose, Alta.

The Prince Albert Laundry Co. will build a new laundry building at that place.

A Chicago company wants to erect a grist mill and brewery at Wainwright, Alta.

The National Elevator Co. will at once erect a 60,000 bushel elevator at Port Arthur.

A special committee has recommended the building of a $30,000 hospital at Wetaskiwin.

Messrs. Battle will shortly erect a building at Thorold for the manufacture of concrete blocks.

The Wetaskiwin Produce Co. will erect a creamery and cold storage building at that town.

The Oliver Mfg. Co. secured the contract to build a new warehouse for Bentley Co., at Lethbridge.

The Battle Creek Health Food Co., London, will build a four storey addition to their plant to cost $2,500.

The Yorkton, Sask., school board are to erect a collegiate next spring at an approximate cost of $13,000.

A large addition is to be made to the Empress Hotel, at Victoria. The addition will cost about $75,000.

The Presbyterian College at Saskatoon will begin building next April, if $50,000 has been collected by that date.

The Parker Dye Works, Toronto, have applied for a building permit for a large and complete gasoline cleaning plant.

The Toronto Street Railway have a permit to erect car barns on Lansdowne Avenue at an approximate cost of $60,000.

W. W. Blair, Winnipeg, is preparing plans for a four storey office building to be erected at a probable cost of $100,000.

V. Williamson has the contract for building an addition to the O. & W. Thum Co.'s fly paper factory at Walkerville.

The McClary Mfg. Co., London, will within a short time, commence work on a new warehouse in the southeast end of that city.

Berry Bros., varnish and paint manufacturers, Walkerville, Ont., contemplate erecting a branch factory at Winnipeg in the near future.

Plans are being prepared for an hotel to be erected at Winnipeg at a cost of $85,000. F. A. Meyers, Fort William, Ont., is interested.

S. Homan has been awarded the contract for the addition to the branch of the International Acheson Graphite Co.'s works, Niagara Falls.

Macleod council has under consideration a project to build a $25,000 hospital, and run it as a civic venture, equipping it in up-to-date fashion.

A building permit was taken out by R. Bowman for a five-storey block at Vancouver. The building is designed for warehouse and factory purposes.

A new eleven-room public school on Logan Avenue, Toronto, instead of the proposed five-room structure, is now the desire of the Board of Education.

The Continental Oil Co. have commenced the foundations of a warehouse at Regina. Stakes have also been set for a warehouse for the Canadian Oil Co.

The Brantford Collegiate Institute trustees have accepted the bulk tender of Schultz Bros. for the erection of the new Collegiate Institute, the price being $64,519.

Negotiations for a site for the Patent Holding & Mfg. Co., of Spokane, have been completed. They intend to erect next spring a $50,000 wagon plant at Calgary.

Hourd & Co., London, have commenced work on additions to their factory which will increase the capacity of the plant over 50 per cent. Two new buildings are being erected.

The Sisters of Charity in Alberta and Saskatchewan announce that a large addition is to be made to the Holy Cross Hospital, Calgary, at a cost of between $75,000 and $80,000.

The congregation of St. Andrew's R.C. Church, Port Arthur, have decided to adopt the plans of G. E. Tanquay, of Quebec, for a new cathedral that will cost from $85,000 to $100,000.

Hon. Geo. A. Cox, Toronto, one of the directors of the Canada Life Association, announces that the company is having plans prepared for a business block to be erected at Vancouver at a cost of $275,000.

A temporary station will be built by the B.C. E.R., so that the present depot may be razed, to make room for the magnificent new station which the company has planned to erect for its New Westminster terminus.

Plans for the reconstruction of the burned wing of the Toronto Parliament Buildings were submitted to Hon Dr. Reaume, Minister of Public Works, by Mr. E. J. Lennox, the architect. The cost is estimated at $285,000.

Mr. Armitage, of Cleveland, Ohio, proposes the building of a $40,000 worsted industry at Ingersoll ; and H. S. Peters, of Dover, N. J., may also establish a Canadian branch factory there for the manufacture of "Brotherhood Overalls."

The Toronto Board of Education will erect a three-storey brick school at Marion Street and Lansdowne Avenue, $55,000 ; a two-storey public school on George Street, $13,000 ; and a three-storey brick high school, on Harbord Street, $50,000.

Work will shortly be commenced on the foundation and basement of the proposed new sanatorium at Little Manitou Lake, near Watrous, Man. At a meeting of the directors held in Winnipeg recently it was decided to appropriate $150,000 of the stock which has already been subscribed, and go ahead with the building at once.

E. M. F. Co. Establish Canadian Plant.

The Studebaker E-M-F Co. will establish a $400,000 automobile plant at Walkerville, Ont. The company will supply the trade of Canada and other British colonies and will be known as the "E-M-F Co. of Canada." The concern will be a subsidiary company of the Detroit firm. Among the incorporators are Frederick H. and J. Harrington Walker, of the Hiram Walker & Sons Co. The money required by the new company will be furnished by the Walkers, and Dr. J. B. Book, Charles L. Palms and Walter E. Flanders, of Detroit. Mr. Flanders will act as president and general manager of the new concern and Robert M. Brownson has been selected as secretary and treasurer. The balance of the board in control of the affairs of the company will be the Walker brothers and Mr. Palms.

Toronto's Pump Contracts.

The following are the descriptions of the pumps for Toronto's waterworks system, and the awards.

Section A—750 revolutions per minute, four pumps, with a capacity of 13,500,000 gallons, main pumping station; tenders from $14,800 to $52,200; awarded to Jens Orten Boving, London, Eng., $14,800.

Section B—Two pumps at the main pumping station, 5,000,000 gallons each, for the high-pressure fire system, from $11,703 to $35,000; awarded to the Caledonia Iron Works, $11,703.

Section C—Four pumps, each with a capacity of 10,000,000 gallons, to be installed at the high level pumping station, from $6,500 to $24,000; awarded to Jens Orten Boving, London, Eng., $6,500.

Section D—Four pumps, to be installed at the high level pumping station, 6,500,000 gallons each, from $7,385 to $18,400; awarded to the Caledonia Iron Works, $7,385.

Section E—Four pumps, to be installed at the Island, each with a capacity of 1,500,000 gallons, from $4,240 to $14,500; awarded to the Canadian General Electric Co., $4,822.

The tender of the Canadian Westinghouse Co., Hamilton, for the electric motors for the electric pumps to be installed at the main pumping station and high-level pumping station has been accepted by the Board of Control. The successful tender was for $107,765. The next lowest tender was from a Glasgow firm, $120,000.

Coke Ovens at the Soo.

A contract for the erection of a coke oven plant, to cost $200,000, is about to be completed by L. N. Willputte, chief engineer of the Kopper Coke Oven Co., with the Lake Superior Corporation of the Soo. The plant will be operated in conjunction with the steel mill. General manager W. C. Franz of the Lake Superior Corporation, confirms the report regarding the contract for the coke oven plant. The plant will be built adjoining the steel plant on the northwest side. A pile driver is already at work on what will mean a $200,000 job. A representative of the Kopper Co. is now in the Soo in the interests of his company.

Hamilton, Ont.

A striking circular has been issued by John P. MacLeod, Assessment Commissioner, Hamilton, containing "a kettle of facts about Hamilton, boiled down and dished up hot." The booklet gives information in regard to the industrial life of the city.

Canadian Crocker Wheel Co.

The St. Catharines City Council has completed the sale of the defunct Ross Traction Engine plant to the Canadian Crocker-Wheeler Co., of Amper, N. J. The company pays $5,000 for the factory and surrounding property, and is given a fixed assessment of $10,000 for a period of ten years, with the understanding that operation be begun at once, the factory to be in complete operation December 31st, 1910, and to continue in operation for a period of ten years, to employ not less than one hundred skilled workmen, and pay annually fifty thousand dollars in wages. They will manufacture motors, generators, etc.

Hamilton Steel & Iron Co.

A meeting of the shareholders of the Hamilton Steel & Iron Co. was held Nov. 17 to confirm the action of the directors in increasing the number of directors from seven to nine and the election of E. B. Osler, M.P., and W. D. Matthews. It is announced that extensive improvements, involving an expenditure of $1,000,000, are to be made to the plant, and that there is no likelihood of the company joining the big steel and coal merger.

British Firm to Erect Factory in Toronto.

The Jens Orten Boving Co., London, England, makers of turbine pumps, and successful tenderers for a number of the pumps to be purchased for Toronto waterworks system, have decided to locate a branch in Toronto. They have contracts in Winnipeg and Calgary.

October Output of Steel Companies.

The Dominion Iron & Steel Co.'s output during October was a heavy one, especially that of the rod mill, which amounted to 8,569 tons. It is claimed that this is a new world's record, being 35 per cent in excess of the previous record for a continuous mill. The October outputs of the Nova Scotia Steel & Coal Co. were: Steel, 7,118 tons; pig iron, 5,640; coal, 77,130 tons. The Dominion Coal Co.'s output for October amounted to 205,215 tons of coal, showing a substantial gain over September. The production for October, 1908, was 262,000 tons.

Opportunities for Canadian Steel Companies.

In the next budget, $20,000,000 will be appropriated for the government railways in Japan, to be used for building a central station at Tokyo, laying two more tracks between Tokyo and Yokohama, and heavier rails over the larger part of the system. If the Canadian steel companies had a representative out here, says G. A. Harris, they could secure some of this business, but it is absolutely impossible to do so unless some one is sent out to make personal effort. In view of the great railway development in China, Canadian manufacturers should not lose this opportunity.

Dominion Iron & Steel Extension.

The Dominion Iron & Steel Co. have closed a contract with the Canada Foundry Co., Toronto, for the construction of an additional blast furnace, two 500-ton open hearth furnaces, and an addition to the Bessemer plant. The blast furnace will give an increase capacity of 400 tons daily. The open hearth furnaces are a new type and will be adopted to the new process of making open hearth steel. A new converter will be added to the Bessemer plant for desiliconizing iron. This will double the capacity of the Bessemer plant.

One hundred and twenty-five coke ovens capable of handling 1,000 tons of coal per day are now under construction. The by-products, such as ammoniacal liquor and coal tar, will also be taken care of by special plants being erected for that purpose.

A number of new mills are also in contemplation by the directors, and it has been practically decided to proceed with the erection of a 22-inch mill. A new rod mill is also contemplated.

A new electric plant will be erected capable of generating 4,000 kilowatts. The pumping station at Sydney river is being equipped for electrical power. It is expected that these extensions will be followed by still other additions of furnaces, ovens and mills.